metals review

the news digest magazine

published by the american society for metals

Volume XXVIII-No. 6 June, 1955

Invitation to Entrants . . . .

10th Metallographic Exhibit

Entries are invited in the 10th A.S.M. Metallographic Exhibit, to be held at the National Metal Exposition in Philadelphia the week of Oct. 17 through 21, 1955. Entries will be displayed to good advantage and awards will be given for the best micrographs as decided by a committee of judges.

Awards and Other Information

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is adjudged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's National headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1956 if so desired.

Classification of Micros

BLACK AND WHITE PRINTS

1. Carbon and alloy steels
2. Stainless steels and heat resisting alloys
3. Iron, cast and wrought
4. Aluminum, magnesium, beryllium, titanium and their alloys
5. Copper, nickel, zinc, lead and their alloys
6. Metals and alloys not otherwise classified
7. Series showing transitions or changes during processing
8. Welds and other joining methods
9. Surface phenomena
10. Results by unconventional techniques (other than electron micrographs)
11. Slags, inclusions, refractories, cermets
12. Color micros (prints; no transparencies accepted)

Rules for Entrants

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints shall be mounted on stiff cardboard; maximum dimensions should be limited to 15 by 22 in. Heavy, solid frames are not permissible because of difficulties in mounting the exhibit. Entries should carry a label on the face of the mount giving:

Classification of entry
Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the BACK of the mount.

Transparencies will NOT be accepted.

Entrants living outside the U.S.A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection." To be acceptable as first-class mail the package should measure no more than 35 x 45 cm. (14 x 18 in.)

Exhibits must be delivered before Oct. 10, 1955, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

A.S.M. Metallographic Exhibit
National Metal Exposition
Convention Hall
Philadelphia 4, Pa.

37th National Metal Congress and Exposition

Philadelphia 4, Pa. — October 17 to 21, 1955

Metals Review

VOLUME XXVIII, No. 6 June, 1955

THE NEWS DIGEST MAGAZINE

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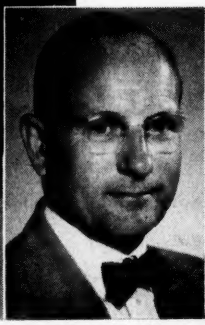
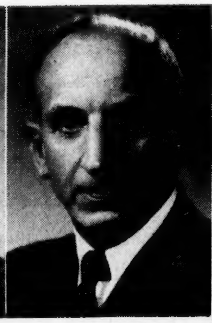
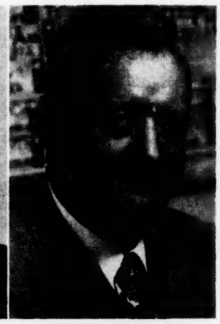
Officer Nominations 1955-1956



A. O. Schaefer *D. S. Clark* *C. H. Lorig* *G. E. Shubrooks* *H. A. Wilhelm*

NOMINATIONS for new national officers of the American Society for Metals have been announced by the Nominating Committee, which met in Pittsburgh on May 19, under the chairmanship of M. W. Lightner, United States Steel Corp.

A. O. Schaefer, currently serving as vice-president, was nominated for president, D. S. Clark, professor of mechanical engineering, California Institute of Technology, has been selected as the nominee for vice-president, and C. H. Lorig, technical director, Battelle Memorial Institute, has been nominated for treasurer.

Two additions proposed for the Board of Trustees are G. E. Shubrooks, manager of research laboratory, Hamilton Watch Co., and H. A. Wilhelm, associate director of the Ames Laboratory of the Atomic Energy Commission and associate director of the Institute for Atomic Research, as well as research professor of chemistry, Iowa State College.

In accordance with the Constitution of the American Society for Metals, additional nominations for any of these posts may be made by written communications addressed to the secretary of the Society and signed by any 50 members. If no such additional nominations are received prior to July 15, nominations shall be closed and at the annual meeting in October 1955 the secretary will cast the unanimous vote of the members for these candidates.

A. O. Schaefer

Adolph O. Schaefer, nominee for president, was elected trustee of A.S.M. in 1952.

He is a graduate of the University of Pennsylvania, having received a B.S. degree in chemical engineering in 1922. He has spent his entire business career with the Midvale Co., Nicetown, Pa., first as a metallurgist from 1922 to 1924, and as assistant engineer of tests for the next 13 years, after which he was made assistant production manager. In 1942 he was promoted to executive metallurgical engineer and in 1945 to executive engineer. In 1950 he was made assistant to the executive vice-president, and a year later vice-president, engineering and manufacturing, his present position.

From 1939 through 1945, Mr. Schaefer was associated with activities concerned with the Government's production of ordnance materials and is on the Government's Advisory Committee for Guns.

Mr. Schaefer is past chairman of the Philadelphia Chapter A.S.M. and has served on A.S.M.'s Handbook, Publications and Nominating committees.

D. S. Clark

Donald S. Clark, nominee for vice-president, is a graduate of California Institute of Technology where he received a B.S. degree in 1929, M.S. degree in 1930 and Ph.D. in 1934.

From 1929 to 1934 Dr. Clark was a teaching fellow of mechanical engineering at Caltech. He was appointed instructor in 1934 and became assistant professor in 1937, and also served as consulting physical metallurgist for Industrial Research Laboratories.

Dr. Clark was a member of the Board of Trustees of the American Society for Metals in 1939-40.

C. H. Lorig

C. H. Lorig, selected as nominee for treasurer, received a Ph.D. degree from University of Wisconsin in 1928. He was employed on different occasions as metallurgist for French Battery Co., Stowell Co., Ladish Drop Forge Co. and Pelton Steel Casting Co., prior to and after completing his graduate work. Later he accepted an assistant professorship in mechanical engineering at Drexel Institute. Since 1930 he has been associated with Battelle Memorial Institute, first as supervising metallurgist connected with the process metallurgy department and later as assistant director of the Institute. He is the author of more than 60 articles and papers which have appeared in scientific and technical journals.

H. A. Wilhelm

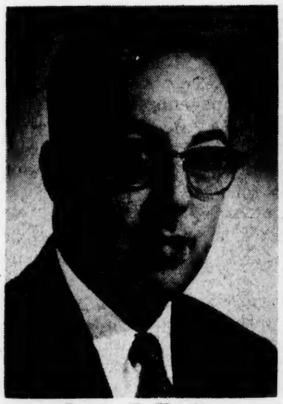
Harley A. Wilhelm, nominee for trustee, a co-inventor of the process for the production of uranium metal who was also instrumental in the development of a process for the large-scale production of thorium metal, was born in Ellston, Iowa, in 1900. He received his B.S. degree at Drake University in 1923 and his Ph.D. from Iowa State College in 1931. While at Drake he was active in athletics, being outstanding in both basketball and baseball. In 1954, Dr. Wilhelm received the Iowa Award of the American Chemical Society.

G. E. Shubrooks

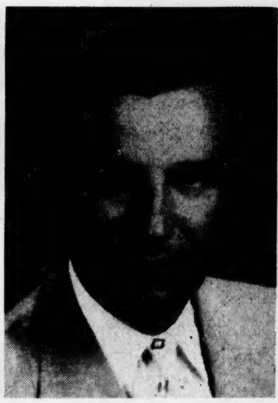
G. E. Shubrooks, the second nominee for trustee, started employment with Hamilton Watch Co. in 1926 as chief chemist and metallurgist and worked in that capacity until 1951 when he was appointed assistant director of research in charge of science laboratories. He was promoted to manager of research in 1954.

Dr. Shubrooks had been associated with Midvale Steel Co., Burnham Boiler Co., General Motors Corp., and H. J. Yeager Laboratories before joining Hamilton. He is a graduate of Franklin & Marshall College.

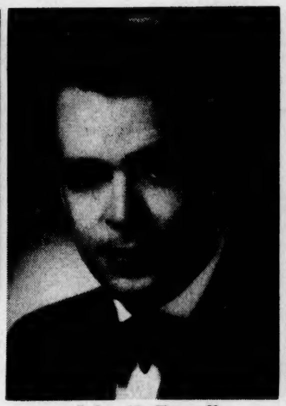
A. S. M. — Staff Changes



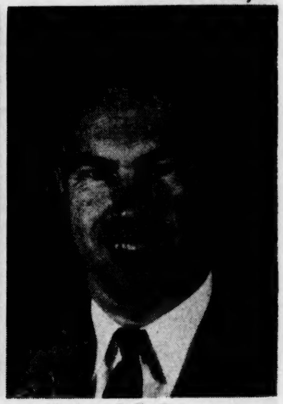
James P. Hontas



John Parina, Jr.



John F. Tyrrell



Anton deS. Brasunas

RECENT additions and changes in the headquarters staff at American Society for Metals represent the continuous growth of the Society in all departments. New names, or familiar faces in positions of new responsibility, are becoming the order of the day. Presented below are short summaries of the most recent changes to have been effected.

John Parina, Jr.

John Parina, Jr., for the past four years associate editor, *Metal Progress,* has been appointed associate editor of the Metals Handbook. In his new position, John is currently preparing for publication the articles submitted by 11 of the 25 A.S.M. technical committees that were organized during the latter part of 1954.

Mr. Parina came to A.S.M. from Baker-Raulang Co. in 1951. His previous experience includes eight years in production and engineering at American Steel & Wire Co., technical editorial staff of *Steel* magazine, advertising work at Warner & Swasey Co., sales promotion and advertising manager at Star Drilling Machine Co., and sales engineer at Baker-Raulang.

John is married and has two young sons, Gregory and David.

John F. Tyrrell

John F. Tyrrell, recently appointed associate editor of *Metal Progress,* has been an advertising representative for the magazine for the past four years, covering the Eastern Seaboard states and Western Pennsylvania.

John is a graduate of Massachusetts Institute of Technology, where he graduated in 1943 with a B.S. degree in metallurgy. He spent a year and a half after graduation with Allegheny-Ludlum Steel Corp., and during World War II served with the Navy as an underwater demolition expert, with additional service at the end of hostilities as an officer aboard various types of landing craft.

Before joining A.S.M., John worked as a metallurgist for Solar Aircraft Co. He is married and the father of four young daughters.

James P. Hontas

James P. Hontas, staff metallurgist, was appointed New York district sales representative for *Metal Progress.* Jim graduated from the Colorado School of Mines as a metallurgical engineer and holds a degree in business administration from Fenn College. He joined Goodyear Aircraft Corp. as a research and development metallurgist after graduation and worked as materials engineer for Clark Controller Co. before joining the A.S.M. staff late last year.

Anton deSales Brasunas

Anton deSales Brasunas, associate professor of metallurgical engineering at the University of Tennessee, has been appointed to the newly created post of director of educational activities.

Dr. Brasunas holds a B.S. degree in chemical engineering from Antioch College, a M.S. degree in metallurgy from Ohio State University and a Ph.D. degree from Massachusetts Institute of Technology. He was research engineer at Battelle Memorial Institute from 1943 to 1947 and metallurgist at Oak Ridge National Laboratory from 1950 to 1952, when he joined the staff at the University of Tennessee. He is currently vice-chairman of the Oak Ridge Chapter and has served in various official capacities for the National Association of Corrosion Engineers and the American Society for Engineering Education.

Dr. Brasunas will organize and put into production more than 40 metals engineering courses to be included in A.S.M.'s extensive home-study program.

Tenth Metallographic Exhibit

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Stainless Steel Topic at Rochester

M. E. Carruthers (Left), of Armco Research Laboratories, Who Discussed "New Developments in Stainless Steel" at a Meeting Held in Rochester, Is Shown With Gil Cox, International Nickel Co., a Member of the Chapter

Speaker: M. E. Carruthers
Armco Research Laboratories

M. E. Carruthers, Armco Research Laboratories, presented a discussion of "New Developments in Stainless Steel" at a meeting held by **Rochester Chapter.**

Mr. Carruthers introduced his subject by reviewing the history of stainless steels since their first commercial application. He then described the many technological developments in stainless steel production methods which have made available a better and more uniform product and some of the newer stainless analyses and their applications.

In melting operations, larger electrical furnaces employing induction stirrers are now being used, thereby producing more uniformity in both composition and temperature. Improved spectrographic methods are permitting very rapid chemical analysis of heats, providing better and faster control of heat composition. Continuous casting of billets and slabs has increased yields. New hot top methods are obtaining shorter shrinkage cavities and therefore improved yields. The scabs and scale on slab and billet surfaces, formerly removed by grinding, are being handled more economically by torch methods. The four-high mills are giving way to the new Sendzimir cold reduction mills with better control of product and increased economy. Bright annealing atmospheres in contrast to oxidizing atmospheres are reducing scale problems. Molten salt descaling is being used to condition scale for easier and more effective removal by acid pickling.

The new manganese-bearing stainless steels will supplement the current 18-8 Cr-Ni varieties in the event of nickel shortages. A wrought, austenitic high carbon 21-4-N chromium - manganese - nickel - nitrogen grade, having a high hardness (145 Brinell) at 1400° F., is being used for automotive exhaust valves.

Mr. Carruthers stated that the extra low carbon (0.03% C maximum) austenitic stainless steels have proved successful for continuous service applications under 800° F. and are therefore replacing a large part of the production in the columbium and titanium-stabilized grades. The precipitation hardening varieties, such as 17-7 PH, 17-4 PH and Stainless-W, are providing a useful combination of hardness as well as corrosion resistance for aircraft parts. These steels do not depend solely on carbon for hardening and retain high strength at temperatures as high as 650° F.

During the meeting, special tribute was paid to the Chapter's sustaining members and those who participated in the series of ten educational lectures recently completed by the Chapter concerning ferrous materials and practical heat treating.—**Reported by Sydney Gamlen, Jr., for Rochester Chapter.**

Oregon Hears Talk on How To Choose Alloys for Use In Steel Components

Speaker: Fred J. Robbins
Sierra Drawn Steel Corp.

"Choice of Alloy and Processing for Steel Components" was the title of a talk given by Fred J. Robbins, president, Sierra Drawn Steel Corp., at a meeting of the **Oregon Chapter.**

Mr. Robbins gave a clear, concise account of several factors involved in the selection and processing of an alloy material for a steel component.

In determining the best material for the part, the basic question is: What is the part going to do in service? This is a question for engineering design and stress analysis. The part must be considered on the basis of past experience, laboratory and field tests as well as trial performance.

In addition to translating engineering design to the proper choice of alloy steel, the cost of the material, availability, function of the alloys, machining, forging and the effect of hardenability and heat treatment on the design must all be taken into account.

Mr. Robbins reviewed the role of alloying elements in steel and the selection of steels on the basis of hardenability. He emphasized the machining difficulties encountered with alloy steels and described the resulphurized and leaded steels which are used to improve machinability and surface finish.

All of these factors were considered together in the analysis of several different components which were pictured and described on charts handed out to the audience. Such parts as open-end box wrenches, alternator shafts, machine rolls, straightening rolls and oil-tool slips were reviewed. Mr. Robbins concluded that the final selection is usually based on a compromise among engineering requirements, cost, procurement and the manufacturing equipment available.—**Reported by James P. Bates for Oregon Chapter.**

Talks on Hard-Facing Alloys

Speaker: C. B. Marshall
American Manganese Steel Div.
American Brake Shoe Co.

C. B. Marshall, field representative, American Manganese Division, American Brake Shoe Co., spoke on "Hard Facing Alloys" at a meeting held by the **Alberta Chapter.** This was the fourth meeting of this recently organized chapter and was attended by 51 members and guests. Mr. Marshall followed his discussion with a question and answer session. **—Reported by J. D. Zmurchyk for Alberta Chapter.**

Addition Made to Sauveur Memorial Museum

A Recent Addition to the Sauveur Memorial Museum, Contributed by A.S.M. Past President W. B. Coleman, Is This Photograph Taken at Columbia University in 1903. From left: L. Webster Wickes; office boy; William Campbell; G. H. Clevenger; Irving Langmuir; Henry M. Howe (seated), in whose honor the A.S.M. Howe Medal was established; M. N. Bowles; Bradley Stoughton, past president; and H. W. Geromanos

Developments in Power And Materials Subject Of Los Angeles Sessions

Speaker: Norman L. Mochel
Westinghouse Electric Corp.

A joint meeting of the **Los Angeles Chapter** and the Los Angeles Section of the American Society for Testing Materials featured a talk by Norman L. Mochel, manager of metallurgical engineering, Westinghouse Electric Corp., on "Power and Materials, Now and in the Future".

Mr. Mochel traced the development of electrical power, starting with the first successful experiments by Edison 75 years ago. He showed slides of some of the first steam-driven electrical generating plants. A comparison was made as to the size, design and power output of the installations of the early 1900's and present-day plants. The speaker pointed out that great strides have been made in the amount of power generated by single shaft and duplex shaft generators. This has been made possible by the use of better materials in turbine construction and by increasing inlet steam pressures and temperatures. In the past, cast iron was used for temperatures of 450° F.; modern-day turbines use a temperature of 1150° F. and require metals able to retain their strength under elevated-temperature conditions. In the future, materials capable of operation at 1350° F. for long periods of time will have to be developed.

Rotor shafts weighing up to 55,000 lb. and 55 in. in diameter are now being used. They are given very rigid quality control inspection prior to usage by X-ray, ultrasonic and magnaflux methods. Large die forgings, weighing up to 8000 lb., are used for throttle valves. These valves are among the largest die forgings being made in the United States at the present time.

Mr. Mochel pointed out that power consumption in the United States has been increasing steadily since 1917, when 268 kw-hr. were used per household compared to 1825 kw-hr. per household in 1950. The price per kilowatt has been steadily decreasing during this time.

A.S.M. Secretary William H. Eisenman, A.S.T.M. Secretary Bob Painter and A.S.T.M. Past-President William Barr, were guests at this meeting. **Reported by E. T. Bergquist for Los Angeles Chapter.**

Rockford Chapter Hears Talk on Quenching Oils

Speaker: L. W. Kalinowski
Sinclair Refining Co.

"Quenching Oils" was the subject of a talk given by L. W. Kalinowski, district staff engineer, Sinclair Refining Co., at a meeting held by the **Rockford Chapter.**

Mr. Kalinowski explained the role of the quench as applied to isothermal transformation diagrams and illustrated the comparative severity of various quenching mediums. He demonstrated how test samples of the same size and material can be used to evaluate quenching oils and also described the hot wire tester used by his company. This instrument consists of a variable transformer which regulates the current flowing through a standard size of constantan wire immersed in a beaker of the quenching oil to be tested. Ammeter readings taken when the wire breaks determine the relative cooling properties of the oils.

Acid number, determination of insolubles and viscosity were given as the most important tests for laboratory control over a quenching oil in use.—**Reported by Quentin C. Bowen for Rockford Chapter.**

Speaks at Notre Dame on Titanium and Its Alloys

Speaker: William W. Wentz
Rem-Cru Titanium, Inc.

William W. Wentz, Rem-Cru Titanium, Inc., who spoke on "Titanium" at a meeting of **Notre Dame Chapter,** presented a well-prepared outline of the history and development of titanium and a discussion of the properties and applications of the various grades of alloys now available for commercial use.

Methods of fabricating, welding, heat treating and machining were described and Mr. Wentz brought out some of the shortcomings of titanium as well as its good points.

He predicted a bright future for the titanium industry with expanding use and production causing a substantial decrease in price.—**Reported by R. C. Pocock for Notre Dame.**

Alloy Development Topic at Rome

At a Meeting Held by Rome Chapter, Truman S. Fuller, Consultant, Spoke on "Alloy Development". Shown are, from left: Ernest E. Grider, program chairman; Mr. Fuller; 25-Year Member Leonard Gibbs, Revere Copper & Brass Inc.; and Max Howard, chairman. (Photo by Utica Daily Press)

Speaker: Truman S. Fuller

Metallurgical Consultant

The public has been saved many millions of dollars during the past 45 years which they would have paid for electric power if the development of metal alloys had not taken place. This statement was made by Truman S. Fuller during his talk on "Alloy Development" at a meeting of the **Rome Chapter.**

Specific examples of savings through the use of modern alloys include: Higher efficiencies in power transformers where the losses have been reduced to about 1/5 the former value; increase in the strength of power house steam generators, enabling the use of higher pressures, thereby getting about 4½ times the power from each ton of coal.

The development of permanent magnets was presented as another case of improved alloys, where increased magnetic strength of about 28 times has resulted in more efficient and smaller magnets for many applications, including radio and television speakers.

Emphasis was given to experimental studies which have revealed the effects of hydrogen during metals processing, including thermal ruptures in steel and embrittlement of copper. Specific instances of such failures were discussed and illustrated with micro slides.

Mr. Fuller, who retired from the General Electric Company in 1953 after some 40 years of service leading to the position of engineer in charge of the works laboratory with that company, is presently a consultant to the Heppenstall Co. and the Rome Cable Corp.

At the business meeting of the Chapter, Leonard Gibbs, manager of technical services, Revere Copper & Brass Co., was presented a Silver Certificate for 25-year membership in the A.S.M. by the chairman, Max Howard.—**Reported by John M. Thompson for Rome.**

Properties of Metals Versus Plastics Compared At Columbus Meeting

Speaker: K. F. Charter

A. O. Smith Corp.

At a recent meeting, **Columbus Chapter** members heard K. F. Charter, administrative assistant, ceramic-organic research and development, A. O. Smith Corp., talk on "Plastics Versus Metals".

A generalized stress-strain curve was presented for plastics. In form, it was very similar to the curve for metals; however, the top yield strength for a non-reinforced plastic is about 14,000 psi., and the tensile modulus of elasticity is about 500,000 psi. The modulus for Fiberglas-reinforced plastics is about 3,000,000 to 5,000,000 psi. In the temperature range in which plastics find service, variations in temperature have a very much greater effect on the stress-strain curves of plastics than on those of metals. All plastics except Teflon and Kel-F absorb water, with the result that some of the weaker bonds are broken. This is a weakening effect which shows up as a decrease in the ultimate strength. The rate of water absorption is directly proportional to the water temperature.

The creep properties of plastics have been investigated extensively. At room temperature, plastics show a delayed deformation subsequent to the instantaneous deformation upon loading, and both an instantaneous and a delayed recovery upon unloading. The leveling-out times for deformation and recovery are about the same and may range from 2 hr. to 2 weeks or more, depending upon the particular plastic. Under reversed stress, plastics exhibit a large hysteresis loop. Plastics absorb 10 to 15 times as much energy under such conditions as do metals; when coupled with their low conductivity this creates problems in the fatigue testing of plastics. Fatigue testing is further complicated by the fact that the effect of temperature on the properties of plastics is very great for both static and dynamic conditions of loading.

Mr. Charter also discussed parts in which plastics have replaced metals, with savings in cost up to 60%. He pointed out that Fiberglas-reinforced plastics are well suited for short production runs, because exceptionally cheap dies may be used.—**Reported by Ellis Fletcher for Columbus Chapter.**

Explains Grain Boundary Creep in Aluminum at Meeting of Penn State

Speaker: Frederick C. Rhines

Carnegie Institute of Technology

Frederick C. Rhines, metals research laboratory, Carnegie Institute of Technology, discussed "Grain Boundary Creep in Aluminum" at a meeting of the **Penn State Chapter.**

Dr. Rhines pointed out that aluminum undergoing creep does not flow continuously. Instead, there are essentially two separate periods, one active and the other almost completely inactive. During the active period, the aluminum will flow to a fair degree in a relatively short time. Following this active period is the induction, or inactive, period during which time there is practically no flow whatever. The length of these induction periods is sometimes as great as 1000 hr. These static and active periods continue alternately until fracture finally occurs.

It is thought that the mechanism for distortion which occurs along the grain boundaries is unlike that along the slip planes. To support this idea, it was shown, by the absence of oxide on slip planes, that the metal along the slip planes is broken. The presence of oxide at the grain boundaries indicates the metal did not break here, although it had still been deformed in this area.

Dr. Rhines interprets the results of this test as showing the lack of any slip along grain boundaries. The yielding which occurs does not take place at an interface but through a finite thickness. Because of the induction periods, the postulate that slip occurs along grain boundaries is probably not correct.

According to Dr. Rhines, perhaps the best explanation for this behavior of the metal is that the area adjacent to the grain boundary undergoes alternative softening, through recovery and hardening, thus corresponding to the active and induction, or inactive, periods.—**Reported by Alex Simkovich for Penn State.**

Heat Treating Heavy-Duty Gears Subject in Oregon

Speaker: Harold J. Bates
Fairfield Manufacturing Co.

At a meeting held by the **Oregon Chapter,** Harold J. Bates, superintendent of metallurgy and inspection, Fairfield Manufacturing Co., spoke on "Today's Problems in the Heat Treatment of Heavy-Duty Gears".

The problems involved in the heat treatment of heavy-duty gears are associated with three major factors: Engineering design, materials and proper heat treating technique.

Mr. Bates confined his talk to automotive-type gears made from low-carbon alloy steel carburized and hardened for heavy-duty trucks, constructional equipment, industrial trucks, diesel engines, tractors, locomotives and machine tools.

Properties essential to satisfactory gear life are decided upon by dynamometer tests, pilot models or long experience with comparable production.

Material for gears is still a problem needing attention. The fundamental material requirements for gears may best be solved if the stress distribution within the tooth due to external loading and the internal stress due to heat treatment and processing are better understood.

One of the problems created by the substitute lean alloy steels is the need for lower and more closely controlled surface carbon content on carburized steels.

It has been recognized that lower and lower hardenability steels require closer heat treating control and more precise gear manufacturing practice.—**Reported by J. P. Bates for Oregon Chapter.**

Receives A.S.M. Graduate Fellowship in Metallurgy

William Reid Upthegrove, Ann Arbor, Mich., is the winner of the A. S. M. $3000 graduate fellowship in metallurgy for 1955

Mr. Upthegrove received his B. S. degree from the University of Michigan in 1950, and his M. S. degree at Michigan in 1954. He served with the U. S. Navy as an engineer from 1950 to 1953. He is married and has been a member of A. S. M. since 1949.

Mr. Upthegrove will make use of the A. S. M. graduate fellowship when he returns to the University of Michigan for advanced study during the 1955-56 academic year.

Shell Molding Explained at New Jersey

"Shell Molding" Was the Subject Discussed by H. J. Cooper, Executive Vice-President, Cooper Alloy Corp., at a Meeting Held by New Jersey Chapter. Shown at the speaker's table are, from left: J. A. Kearney, chairman; Mr. Cooper; and J. M. Loiacono, technical chairman of the meeting

Speaker: H. J. Cooper
Cooper Alloy Corp.

H. J. Cooper, executive vice-president, Cooper Alloy Corp., presented a talk on the "Shell Molding Process" at a meeting of the **New Jersey Chapter.**

Shell molding, Mr. Cooper explained, is a comparatively new foundry technique. He mentioned that, as often occurs with new techniques, some misunderstandings have arisen as a result of overemphasis on the possibilities of the process. Even so, it is a fact that, with proper recognition of the limitations, the process has much to offer in regard to the close dimensional accuracy attainable and its adaptability to automation for volume production.

The process is entirely different from normal mold-making methods. A properly designed pattern plate, made of metal, is heated to a controlled temperature, usually around 450° F., by suitable strip heaters. The sand mixture used contains a small amount of special resin, a content of 6 to 7% being typical. The progress in shell molding was stated to have paralleled the progress in the development of these adhesives. The basic idea is that contact of the sand and resin mixture with the heated pattern plate causes the thermosetting resin in the sand to form a shell-like mold on each surface of the pattern plate. The thickness of shell formed is determined by the temperature employed and the period of time the heated pattern plate remains in contact with the sand and resin mixture. In an automatic setup, the shell mold halves are ejected by pins and then the equipment begins the next mold-making cycle.

In mold closing, the mating faces of the top and bottom shell molds are bonded together with an adhesive. Once bonded together, the mold cannot be taken apart. It does not tend to absorb water and can be stored indefinitely prior to use. Conventional sand cores or shell cores can be employed when required. When the final casting is made, the resin burns out and the molds disintegrate to permit easy removal of the casting.

Although Mr. Cooper's company has worked only with stainless steels, the process can be used with success for carbon steels, iron and nonferrous alloys.

Castings produced by the shell molding process are notable for high quality of soundness, surface detail and smoothness. The dimensional accuracy obtainable within a mold section can be as close as 0.006 in. per in. of length, although this ultimate degree of accuracy may require experimental trials to accomplish it. Dimensional tolerances through the cope and drag mold halves are affected by the accuracy of mold closure conditions but can be held to ±0.015 in. The process cannot be expected to eliminate all machining but will substantially reduce the amount required.

The speaker emphasized that, for successful application of the process to achieve high quality at satisfactory costs, it is desirable that consultation be arranged with the shell mold casting supplier before, rather than after, the design of a part is completely settled. Acceptable modifications in design based on the principles that have been established, which will give much better over-all results, can often be suggested.—**Reported by K. B. Baker for New Jersey Chapter.**

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the collected, edited, published and distributed over *one hundred million pages* of metallurgical information.

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Ceramic Coatings—A process for coating a wide variety of substances by feeding powdered ceramic materials through a simple flame gun has been developed at Armour Research Foundation. The process is called flame spray ceramics.

Research—A research program to investigate the application of radioactive tracers to the study of metallurgical problems has been completed by the Engineering Research Institute at the University of Michigan for Army Ordnance. A report may be obtained by writing to the Institute.

Combustion Conference—A joint conference on Combustion is being sponsored by Great Britain's Institute of Mechanical Engineers and the American Society for Mechanical Engineers. The Conference will be held at M.I.T. from June 15-17 and at the Institution of Civil Engineers in London from Oct. 25-27.

Photo-Elasticity—A course in photoelasticity, designed for practicing engineers and graduate students, will be offered during the fall semester at Illinois Institute of Technology. Max M. Frocht, research professor of mechanics and director of experimental stress analysis, will conduct the course.

Atomic Research—Manufacturers, electric power companies, research institutions and other nongovernment agencies will spend approximately $300 million of their own money in the next four years on atomic energy research.

Transducers—Low-frequency flat-type transducers, developed for Circosonic ultrasonic metal degreasing equipment to improve the efficiency of ultrasonic cleaning methods and extend the size of workpieces that can be handled, have been developed by Circo Equipment Co.

Vitreous Frit—Development work on a nontoxic, chemically resistant vitreous frit for porcelain enamel which can be fused to aluminum and its alloys has been developed by Minnesota Mining & Mfg. Co. The lead-free frit is being developed as a decorative finish for aluminum.

Foundry Grant—For the second straight year, American Steel Foundries, Inc., has made a $1000 grant to Illinois Institute of Technology to foster foundry education.

Reunion—The Alumni Reunion of the Minnesota School of Mines and Metallurgy will be held Oct. 21. Reservations should be made through R. L. Dowdell, 306 Appleby Hall, Minneapolis 14, Minn.

Metal Plate—Aluminum has been teamed up with lead to make aluminum-cored lead anodes for use in chromium plating and sulphuric acid electrolytic processes by Reynolds Metals Co. and Knapp Mills, Inc.

Economics Research—A department which combines the efforts of scientists, engineers and economists to solve a variety of engineering economic problems has been set up at Armour Research Foundation.

Aluminum Coils—Continuous lengths of pre-anodized high-purity aluminum in coils, known as Al-Kolr, is being offered by Continental Sunfast Products, Inc. Al-Kolr in gold, silver and other brilliant colors is available in qualities which will take stamping, piercing, forming and drawing without destroying the high-luster finish.

Selas Plant—A $1 million plant for the Selas Corp. of America, designers and manufacturers of automatic heat treating, brazing and heat processing equipment, has been started at Dresher, Pa., 22 miles south of Philadelphia.

Rolling Titanium—Titanium will soon be rolled to a thickness of 0.0005 in. by the American Silver Co., which has had a research team working on the development for the past year.

Pit-Type Furnace—Pereny Equipment Co. has developed an inverted pit-type furnace for operating at maximum temperature of 2900° F. for National Cash Register Co.'s laboratory work.

Viscosity Measurement—Castor-Severs micro-rheometer, an instrument for accurate measurement of viscosity of small samples at high rates of flow, is now being marketed by Burrell Corp.

Cutting Fluid—Tool life in machining titanium metal with a synthetic, water-soluble cutting fluid increases as much as 300 to 500% as compared to tool life with heavy-duty solubilized oils, according to results obtained by Carbide and Carbon Chemicals Co.

Brazing—Fast, dependable automatic brazing for many types of small and medium-size assemblies is provided by the self-contained, gas-fired packaged unit developed by Selas Corp. The unit uses precise control of combustion and automatic timing to produce sound brazed joints of uniform high quality at high speed.

Atmosphere Generator—A streamlined endothermic atmosphere generator, completely wired, piped and assembled in a package unit, is being offered by Lindberg Engineering Co. The Hyen Hydryzing generator is a fully automatic process for producing low-cost protective atmosphere for bright hardening, annealing or brazing of steel totally free from decarburization or carburization.

Grid Wire—A molybdenum wire, Moly-G, developed for grids in power and receiving lines, has been announced by Fansteel Metallurgical Corp.

High-Vacuum Pump—Removing 12½ lb. of air per hr. from a semi-continuous, vacuum melting and casting furnace with a single high-vacuum pump, is now possible with the diffusion-ejector pump developed by Consolidated Vacuum Corp.

Welding Conference—The second annual Midwest Welding Conference will be held Feb. 1 and 2, 1956, at Armour Research Foundation. Twelve speakers will discuss various phases of welding.

Addition Agent—A new grade of titanium metal for use as an addition agent in the manufacture of ferrous and nonferrous alloys has been announced by Du Pont Co. The pellets, titanium metal, grade NDA, are used effectively as ladle additions in the production of the 300 series of stainless steel and high-temperature-resisting alloys.

Press Brake—A hydraulically operated press brake, said to develop 12 tons of pressure and having a 36 in. length of bed and ram, has been announced by O'Neil-Irwin Mfg. Co. Important feature of this Di-Acro Hydra-Power press brake is the dependability of its stroke control.

Metallurgy Scholarship Holders at Minnesota

Holders of the Several Different Scholarships Established at the School of Mines and Metallurgy at the University of Minnesota by Metallurgical and Mining Companies, Engineering Societies and a Fraternity Include, First Row, From Left: M. C. Vagle, L. A. Neimark, R. G. Groen, K. P. Coen and R. E. Husby; Second Row: Paul A. Garmers, T. W. Burnstad, Robert C. Sundahl, Who Holds the A.S.M. Scholarship, and G. E. Schultz; Third Row: Charles I. Hansing, Harold W. Krueger, Robert A. Erickson, Willmar K. Boeder and Richard C. Hemmersbaugh; and in the Fourth Row: Roger A. Smullen. (Reported by Dean T. L. Joseph)

Outlines Types of Gas Burners at Tri-City Chapter

Speaker: D. A. Campbell

Eclipse Fuel Engineering Co.

D. A. Campbell, vice-president, engineering and research, Eclipse Fuel Engineering Co., addressed the **Tri-City Chapter** on "Types of Industrial Gas Burners and Their Applications" at a recent meeting.

Mr. Campbell defined an industrial gas burner as a device for the final release of air-gas or oxygen-gas mixtures or air and gas separately into the combustion zone. He reviewed the physical and thermal properties of individual gases and commercial gases, including butane, propane, methane, natural gas, coal gas, oil gas, carburetted water gas, carbon monoxide, hydrogen and acetylene. Mr. Campbell explained how the difference in speed of burning of various gases affects the design of burners and pointed out that many gases require exact mixtures for combustion while others burn even with wide variations. Percent by volume of such gases as methane, propane, butane and natural gas must be carefully controlled, while hydrogen, acetylene and carbon monoxide will burn through a wide range of air or oxygen-gas mixtures.

Gas burners or systems can be classified into two main groups—atmospheric or low-pressure burners, and blast or high-pressure burners. Atmospheric burners operate at very low pressure and handle only a partially complete gas-air mixture so that secondary air is needed to complete combustion. They can be burned in the open or through a hole in the combustion chamber wall or on pipe manifolds.

Blast burners handle mixtures of gas and air at pressures considerably above atmospheric. Mixtures may be complete or partial, but because of the velocities involved, blast burners must have some means of continually localizing the flame to keep it from blowing away from the nozzle. The greater the mixture pressure or velocities used, the more important it becomes to hold the flame. These burners usually use a refractory combustion tunnel or tuyere block of considerably larger volume than the nozzle as part of the burner. Design is usually such that combustion is complete before the gases get out of the burner tunnel into the furnace chamber. Because the temperature reached in combustion tunnels is often very high, burner blocks may melt unless high-temperature refractories are used. Blast burners generally have a gas and air mixing device combined with the burner nozzle. These mixing devices may be classified into four groups: Gas jet mixers in which free air is drawn into the mixing chamber by the kinetic energy of the gas in the gas jet; air jet mixers in which pressureless gas is drawn into the mixing chamber by the kinetic energy of the air issuing from the air jet; nozzle mixing devices which keep gas and air separate until both issue from the nozzle into the combustion zone; and combinations of these groups.

The most commonly used burners in industry use zero pressure gas which is drawn into the mixing chamber by the high-pressure air jet.

Mr. Campbell described the types of flames which can be produced by the various types of burners. He explained how nonluminous, luminous, radiant and short and long flames can be used to advantage, depending upon the application for which the burner is designed.

Mr. Campbell's talk was illustrated with slides and he distributed several charts and graphs to his audience.—**Reported by P. N. Walseth for Tri-City Chapter.**

⊕ has produced and makes available for showing before chapters and educational institutions, moving picture films pertaining to metals.

Meet Your Chapter Chairman

NORTHWESTERN PENNSYLVANIA

WILLARD ROTH, advisory engineer, Westinghouse Electric Corp., was born in Portage County, Ohio, and attended Ohio Northern University and the University of Pittsburgh. He has been associated with Westinghouse since leaving school, first in development and field engineering and research before being assigned his present position.

Mr. Roth is the author of the textbook "Electric Heating Furnaces" for International Correspondence School, Scranton, Pa., and he has also written a number of technical articles on industrial heat treating furnaces and processes. Willard is married and has one girl. His primary wish in life is for enough time to indulge his interests in fishing, golf and bridge.

PUGET SOUND

CLINTON R. LUNDY, service engineer, Kaiser Aluminum & Chemical Corp., was born in Seattle, Wash. He received his B.S. degree in metallurgical engineering from the University of Washington and worked in the materials testing department for Boeing Airplane Co. and as a production metallurgist before coming to his present job.

Clint is married, no children. He is an avid tennis fan and belongs to the Seattle Chamber of Commerce.

INLAND EMPIRE

FRANCIS M. KRILL, head of the metallography section, department of metallurgical research, Kaiser Aluminum & Chemical Corp., was born in St. Louis in 1921. He was on the track team at the Missouri School of Mines and Metallurgy, where he received his degree in 1943. He has worked as a metallurgist and research investigator for Aluminum Co. of America, and as a metallurgist with the Manhattan Project in Los Alamos, N. Mex., while serving in the Army during World War II.

Fran is married and has two children, Leonard and Allan. He is a member of honorary fraternities and active in choral work and color photography, and is also a golfer. He has served on various committees of his Chapter and on the A.S.T.M. committee on metallography.

UTAH

HEBER C. BRIMLEY, a native of Salt Lake City, Utah, attended business college and the University of Utah, where he was on the football and track teams. His first job out of school was with a grain brokerage and he held several positions in business and office management before coming to his present job as technical field representative for the Columbia-Geneva Steel Division of U. S. Steel Corp.

Heber has one son, described as a "big old six-foot fullback" by his proud father. He is a member of the Aviation Club of Utah and the National Gas Association. Hunting and golfing are Heber's primary outdoor interests.

CALUMET

J. R. WOODFILL, supervisor of industrial sales, Northern Indiana Public Service Co., was born in Aurora, Mo., and attended the University of Illinois. He played tennis and baseball while at school.

Married for 25 years and the father of two children, Mr. Woodfill is a member of the Indiana Society of Professional Engineers, the Midwest Industrial Gas Council and the Great Lakes Power Club, as well as the Lions, American Legion and the Elks.

Mr. Woodfill saw active service as a lieutenant-colonel in the Signal Corps in the European Theater during World War II.

NEW HAVEN

EARLE W. LOVERING was born in Arlington, Mass., and graduated from Massachusetts Institute of Technology in 1938.

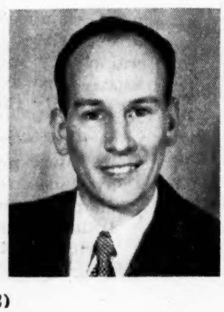
Mr. Lovering started work as a metallurgist for Revere Copper & Brass Inc. Intermediate jobs were as sales metallurgist and supervisor of methods for Revere in the Los Angeles and Detroit offices, and as chief metallurgist and assistant works metallurgist for Seymour Manufacturing Co. He is presently metallurgical engineer for the Scoville Manufacturing Co.

Earle is married and has three children, Frances, age 9, Sarah, age 5 and Richard, age 4. He likes to hunt, fish and go boating, and enjoys working in his garden or just spending his spare time with his family.

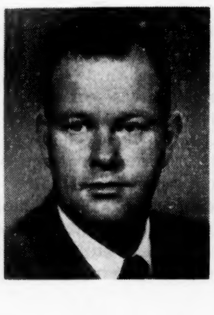
He has served on various committees of the New Haven Chapter and has written an article on pickling for the A.S.M. Metals Handbook. He holds memberships in A.S.M.E., A.S. T.M. as well as the British Institute of Metals.

J. R. Woodfill

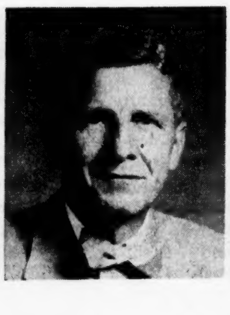
F. M. Krill



C. R. Lundy



W. Roth



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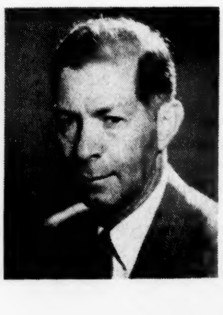


Minnesota Hears Talk on Chromizing to Improve Surface Quality of Steel

Speaker: Richard P. Seelig
Chromalloy Corp.

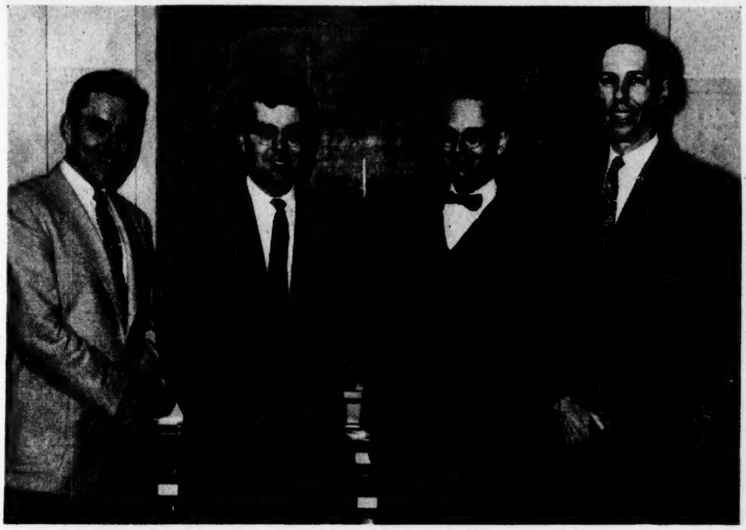
Richard P. Seelig, executive vice-president, Chromalloy Corp., presented a talk entitled "Chromizing Improves Surface Properties of Steels" at a meeting of the **Minnesota Chapter.**

Mr. Seelig explained that chromizing does not deposit a coating or film on a ferrous metal. Instead, it transforms the surface of the steel by a chemical substitution of the chromium atoms for iron atoms, producing either high-chromium stainless steel or chromium carbide. Chromizing is commonly accomplished by a gas reaction at temperatures of 1650 to 2100° F., although some liquid chromizing is also done.

Mr. Seelig explained that the chromizing treatment can improve the corrosion and heat and wear resistance of low carbon and many types of alloy steel.

Some typical applications of the chromizing process are heat shields of various types, wear resistant structural parts for wire-drawing and textile machines, nuts, bolts and other fasteners subject to heat in aircraft and other applications, and combustion chamber and exhaust parts.—**Reported by Lyle D. Gutsche for Minnesota Chapter.**

Oak Ridge Chapter Conducts Course on Heat Treating



Lecturers for the Oak Ridge Chapter's Educational Course on the "Heat Treatment of Steel" Included, From Left: W. O. Harms, Oak Ridge National Laboratory; J. L. Scott, University of Tennessee; G. P. Smith, Oak Ridge National Laboratory; and E. E. Stansbury, University of Tennessee

An educational series of four lectures on the "Heat Treatment of Steel" was presented at the University of Tennessee by the **Oak Ridge Chapter.** The course, which was sponsored in cooperation with the Division of University Extension, University of Tennessee, was designed particularly for persons without extensive metallurgy backgrounds. Included with the series was a set of bound lecture notes compiled by E. E. Stansbury, professor of metallurgy, University of Tennessee, covering the specific topics presented in the lectures.

The total enrollment for the series was 111, and of these 70 had perfect attendance at all four lectures. Delegations from Chattanooga and Bristol, Tenn., traveled over 100 miles to attend the lecture course.

An understanding of several pertinent metallurgical principles was provided in the first two lectures, and these principles were then employed in the remaining lectures to explain the mechanisms of the heat treatment of plain carbon and alloy steels. Following the final meeting, an open house was held in the metallurgy division of the University of Tennessee featuring laboratory demonstrations and exhibits illustrating important points covered in the lectures. Speakers and topics were:

G. P. Smith, Oak Ridge National Laboratory, who opened the series with a talk on "Metal Structures, Metal Deformation and Diffusion". The lecture concerned generally the structure of crystalline solids, with special reference to the structure of metals. Detailed consideration was given the solidification of a metal, the annealing of a deformed metal and the diffusion of one metal into another.

W. O. Harms, Oak Ridge National Laboratory, spoke on "Simple Alloy Systems, Microstructures and Iron-Carbon Alloys". He described the microstructures and phase diagrams of several types of alloy systems containing two metals. Special attention was devoted to the iron-carbon system, particularly the alloys comprising the plain carbon steels.

"The Principles of the Heat Treatment of Steels" were discussed in the third lecture by J. L. Scott, instructor in metallurgy, University of Tennessee. Utilizing the background information presented in the first two lectures, the mechanisms of heat treatment and resulting metallic properties were set forth. Problems in quenching and tempering were cited and remedial procedures outlined.

The final lecture, "Hardenability and Alloy Steels", was given by E. E. Stansbury, professor of metallurgy, University of Tennessee. The effect of section size on response to heat treatment and the role of alloying elements in altering this response were pointed out. Dr. Stansbury also explained how hardenability is estimated for various steels and suggested methods for the selection of alloy steels for various applications.—**Reported by Jack H. DeVan for Oak Ridge Chapter.**

Delegations From Bristol and Chattanooga, Tenn., Traveled a Distance of Over 100 Miles to Attend the Course on the "Heat Treatment of Steel" at the University of Tennessee, Presented by the Oak Ridge Chapter. Included in this group were, front, from left: W. E. Colquitt, John Holcomb, I. B. Gonia, Jr., E. W. Arnold, C. F. Kellis and E. G. Moffit, all from Chattanooga. Back, from left: E. L. Beck, Carl Osborne, Carl D. Mathes, A. H. Wolff, George E. DeVault, and G. E. Elder, all from Bristol

SLA Metals Division Meeting

Two A.S.M. members were guest speakers at a symposium held by the Metals Division, Special Libraries Association and presented at the annual SLA convention, Hotel Statler, Detroit, June 14. At an afternoon session on that date, William A. Reich, manager of advance development, Carboloy Department, General Electric Co. and Robert F. Thomson, head of the metallurgy department, General Motors Corp. Research Laboratories Division, discussed "New Horizons in Metals and Their Use."

The morning session featured library procedures and papers by Miss Dorothy J. Forman of the General Motors Corp. Research Laboratories Division, Mrs. Dorothea M. Rice, librarian, American Metal Co., and Miss K. Genevieve Ford, librarian at the Titanium Division of the National Lead Co.

Peoria Students Visit Allis-Chalmers

As a Part of Its Educational Program, Peoria Chapter Sponsored a Visit to the Allis-Chalmers Manufacturing Co. for Members of the Metallurgical Engineering Department of the University of Illinois. One feature of the visit was a trip through the metallurgical department. Shown is a portion of the group viewing the cutting of track bolts which will be later utilized in an impact test. At extreme right is Roy F. Kern, chief metallurgist at Allis-Chalmers, third from right is B. Ricketts, professor, University of Illinois. (Reported by J. G. Frantzreb for Peoria)

Roberts at Pacific Northwest Chapters

During a Visit Made by National President George A. Roberts to the British Columbia Chapter, He Presented an A.S.M. Scholarship to Grenville Robert Mason, a Student at the University of British Columbia. Dr. Roberts, who also visited the Oregon and Puget Sound Chapters on his swing around the Northwest Circuit, talked on "Toolsteels—New Developments and Applications". (Reported by J. Stokes for British Columbia Chapter)

Albuquerque Receives Chapter Charter

The Albuquerque Chapter Received Its Charter From the National Headquarters Late in March. Walter Crafts, A.S.M. Trustee (left), is shown presenting the charter to J. L. Abbott, Chapter chairman, at a recent meeting

Compliments

To ROBERT F. THOMSON, head of the metallurgy department, General Motors Research Laboratories Division, on being awarded the John A. Penton Gold Medal by the American Foundrymen's Society. Dr. Thomson is past chairman of the Detroit Chapter.

♦ ♦ ♦

To SAM WORCESTER, of Butte, Mont., on being awarded a $400 A.S.M. Scholarship for his junior year at the Montana School of Mines. He was selected by the department of metallurgy on basis of scholarship, ability and engineering promise.

♦ ♦ ♦

To MAURICE J. DAY, director of research and development, Crucible Steel Co. of America, who was one of eight outstanding American engineers to receive a special Centennial Citation and Award from Michigan State College recently. The awards were given for "outstanding contributions to society, for achieving distinction in their endeavors and for setting the highest standards of accomplishments".

♦ ♦ ♦

To CHARLES E. NELSON and RICHARD A. OSTER on being elected directors of the American Foundrymen's Society for three-year terms. Mr. Nelson is technical director, magnesium division, Dow Chemical Co.; Mr. Oster is director of the Beloit (Wis.) Vocational and Adult School.

♦ ♦ ♦

To JOHN B. CAINE, technical consultant to the foundry industry, on being awarded the John H. Whiting Gold Medal of the American Foundrymen's Society, for his "outstanding contributions to industry, particularly in the field of foundry sand research and applications"; to JOHN EDWARD REHDER, director of technology and research for Canada Iron Foundries, Ltd., on being awarded the Peter L. Simpson Gold Medal of the A.F.S. for his "outstanding contributions to foundry knowledge of cast metals"; and to FRED J. WALLS, in charge, Detroit technical field section, International Nickel Co., on being chosen to deliver the A.F.S.'s Hoyt Memorial Lecture during the Society's annual meeting in May.

♦ ♦ ♦

To FRITZ V. LENEL, professor of metallurgical engineering, Rensselaer Polytechnic Institute, on being chosen to present the fourth annual Gillett Memorial Lecture, sponsored by the American Society for Testing Materials and Battelle Memorial Institute. Dr. Lenel will talk on "Powder Metallurgy".

♦ ♦ ♦

To ALTON F. DAVIS, senior vice-president, Lincoln Electric Co., for being presented one of the first distinguished alumnus awards presented by Ohio State University's College of Engineering.

Explains How Residual Stresses Affect Fatigue Life of Metal at Saginaw

Speaker: Raymond L. Mattson
G. E. Research Laboratories

An informative talk on the "Effects of Residual Stress on Fatigue Life of Metals" was given by Raymond L. Mattson, assistant head of the engineering mechanics department, General Motors Research Laboratories, at a meeting of the **Saginaw Valley Chapter.**

Mr. Mattson stressed the importance of the factors involved in evaluating effects of stress formation in various processing operations and effects of stress distribution in the final product as a desirable characteristic.

The magnitude of stress at the surface is very important and should be given serious consideration for the improvement of fatigue life of products in our daily use. Considerable research has been done in recent years on stress analysis; however, there is yet a great deal of work to be done to better the products which are in every-day use.

Mr. Mattson demonstrated a "model beam" which, upon loading, exhibits what actually happens when residual stresses are retained and improperly distributed.—**Reported by L. A. Ciesielski for Saginaw Valley.**

New Films

Fiery Magic

A 16-mm. sound-color film is released by National Carbide Co., a division of Air Reduction Co., Inc.

The film's title refers to the blazing electric furnaces where coke and lime are combined to form calcium carbide. Consecutive steps in the manufacture of carbide are clearly demonstrated. The film also portrays the varied uses of acetylene. It may be borrowed by writing to district offices of the Air Reduction Sales Co., National Carbide outlets or directly from National Carbide Co., 60 East 42nd St., New York 17, N. Y.

American Pullmax

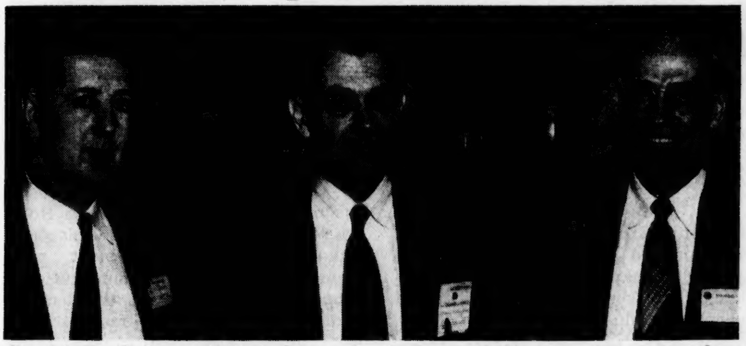
American Pullmax Co., Inc., has released a 16-mm. sound movie which gives a complete description of its line of sheet and plate-working machines.

The film describes the precision construction of the machines and goes on to give detailed demonstrations of the types of cutting which can be done by the machine. It may be borrowed from: E. G. Kihlstrom, American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill.

Roberts Speaks on High Speed Steels

National President George A. Roberts, Vice-President, Vanadium-Alloys Steel Co., Spoke on "High Speed Steels" at a Meeting Held by the Springfield Chapter. From left, are: Stuart E. Sinclair, technical chairman; Dr. Roberts; and Ridgway A. Cook, chairman. (Reported by C. A. Keyser)

Traces Developments in Boron Steels



Gerald D. Rahrer, United States Steel Corp., Talked on "New Developments in Boron Steels" at a Meeting Held in Tulsa Recently. Present were, from left: R. E. Miller, secretary; Mr. Rahrer; and George Sykora, chairman. (Reported by R. E. Miller: Photograph by J. C. Holmberg for Tulsa)

Panel Discusses Surface Hardening

At a Panel Discussion on "Surface Hardening" Held by Chicago Chapter, Methods and Techniques of the Many Surface Hardening Treatments Were Covered by Experts in the Field. Panel members, from left, were: H. M. Gregoire, Linde Air Products Division, Union Carbide & Carbon Corp.; C. H. Samans, vice-chairman; T. H. Spencer, Caterpillar Tractor Co.; F. T. McGuire, Deere & Co., Moderator; D. R. Edgerton, Lindberg Steel Treating Co.; J. H. Clark, International Harvester Co.; J. A. Kubik, chairman; and W. A. Darrah, Continental Industrial Engineers, Inc. The evening was dedicated to Chicago's past chairmen. (Reported by C. Saenger)

Students Learn Mysteries of Metals

R. M. Brick, Head of the Department of Metallurgy, University of Pennsylvania, Demonstrates the Effects of Corrosion and Ways of Preventing Corrosion During the Philadelphia Chapter's Junior Section's Lecture-Demonstration Conference Presented to Some 683 High-School Students

For weeks prior to Mar. 9, the Franklin Institute in Philadelphia was amazed at the constant stream of oddly shaped bundles and packages that were deposited in its Division of Education.

All of the packages in this stream of deliveries contained rare assortments of metals, special equipment, slide films and other paraphernalia appropriate to the production of a notable demonstration for a large audience of junior and senior high-school students.

Louis F. Calzi, metallurgical engineer, Superior Tube Co., and program chairman of the **Junior Section of the Philadelphia Chapter,** directed to its successful conclusion a presentation upon which he has worked for several years, the lecture-demonstration "Mysteries of Metals" and a career forum on metallurgy, offered in co-operation with The Franklin Institute of the State of Pennsylvania.

The audience attending this intriguing story of metallurgy was composed of the more gifted and most interested science students from the junior and senior high schools in the Philadelphia area, along with their sponsoring teachers, the purpose for inviting this type of an audience being to cultivate a youthful interest in this little publicized science with the ultimate aim to have the students follow metallurgy as a career.

Philadelphia Chapter's Joseph Gray Jackson lectured on the everyday use of metal's mysteries, while Robert W. Neathery, head of Episcopal Academy science department, performed correlating demonstrations. Fine assets were given the lecture and career forum by members of local universities, institutes and industries, with 36 American industries contributing useful ore and metal processing brochures and souvenirs for presentation to the audience.

The career conference group was addressed by J. P. Clark, Jr., partner in the John P. Clark Co., who spoke on the subject, "Selecting Metallurgy as a Career". Brief talks from representatives of local industries, universities and institutes on the various phases of metallurgy available today and in the future followed. Displays containing working models and products depicting these phases were inspected by the students while at the same time, personal consultations were conducted.

Original plans were set up with the lecture-demonstration being presented first in the program, followed by a career conference, but due to the great response from the participating schools, it was necessary to conduct the lecture and career conference simultaneously. A repeat performance of the lecture was given for those students attending the career conference. Some 683 persons attended the presentation.—**Reported by R. H. Staub for the Junior Section—Philadelphia.**

British Columbia Members Visit Rolling Mills at Western Canada Steel Co.

Some 70 members of the **British Columbia Chapter** were the guests of Western Canada Steel Co.'s rolling mill and electric steel-melting furnace during a recent meeting. After hearing a brief description of the processes, the party was divided into two groups for guided tours around the plants.

The schedule was arranged so that each party saw a pour made at the arc-melting furnace. After dividing into smaller groups, the members were shown around the rolling mill, which is one of the first plants to use high-frequency induction heating tunnels to heat the ingots prior to rolling. Two tunnels feed ingots to 16 and 12-in. mills where bars, rounds and shapes are rolled.

The first part of each tunnel is supplied with 60-cycle current which heats the ingot to about 1200° F. As the ingots are pushed through the tunnel they enter a high-frequency field of 600-cycle current which heats them to 2250° F. The operation consumes about 4-million k.w. hr. per month, and supercedes oil-heating methods with a saving of 75% time and $1 fuel cost per ton of steel heated. The installation cost half a million dollars.

After the visit, members were entertained by Western Canada Steel Co., and questions were answered by a panel of experts from the company. **—Reported by J. Stokes for British Columbia Chapter.**

Lectures on Modern Steels Given by Carolinas Chapter

The Carolinas Chapter has completed a series of four lectures on "Modern Steels". The course was duplicated in Winston-Salem, in Charlotte and in Sanford, to give every member of the Chapter an opportunity to attend. Courses and speakers were as follows:

"Inspection and Testing of Steels", by Robert A. Shattuck, metallurgist, Edgecomb Steel Co.; "Alloy and A.I.S.I. Steels", by Norman Brown, sales metallurgist, Wheelock, Lovejoy and Co.; "Stainless Steels" and "Machining of Stainless", by C. B. Post, metallurgist, and E. Von Hamrich, Carpenter Steel Co.; and "Tool-steels", by C. P. McShane, metallurgist, Crucible Steel Co.

The course on "Modern Steels" was selected on the basis of a preference indication poll conducted among students of the 1954 lecture series as the course having the greatest interest among metal people in the area.

Those attending three lectures received certificates of attendance. This was the second series of educational lectures to be presented by the Carolinas Chapter.

Cleveland Hears Talk on Ultra-High-Strength Steel

Speaker: A. R. Troiano

Case Institute of Technology

A. R. Troiano, head of the department of metallurgical engineering, Case Institute of Technology, spoke on "Ultra-High-Strength Steels" at a meeting held recently by the **Cleveland Chapter.**

Until recently, steels heat treated to 180,000 psi. represented the practical limits of safety; today, however, 240,000 psi. is common, 300,000 psi. and above are within the limits of possibility. This increase in tensile strength has not come about without first solving many problems. Occasionally delayed failures in service occur. A baffling characteristic of this type of failure is that spontaneous brittle fracture occurs at stresses that have previously been successfully sustained and in materials which have shown good ductility in conventional laboratory tests.

Since these higher tensile strengths are primarily used in aircraft work and electroplating is frequently used on such parts, hydrogen embrittlement takes on new importance. The phenomenon of brittle delayed failures under static loads, and the relationship, if any, of this type of failure to hydrogen, brought about the necessity for study.

It was found that hydrogen distribution is as significant as hydrogen content. Influencing factors are depth and degree of severity of embrittlement and aging.

Dr. Troiano stated that there is a minimum critical value of applied stress below which delayed fracture failure does not occur. It appears to be influenced by the stress necessary to cause some given critical amount of highly localized plastic flow. Notch effect and hydrogen distribution will vary the stress flow and, in turn, the minimum critical value. This minimum critical value may vary from values close to yield strength to less than 40% of yield strength.

Loads above the minimum critical stress for brittle delayed failures result in progressive damage to the steel, which if it has proceeded to any appreciable degree, results in permanent damage.

Three variables, applied stress, time to fracture and aging time at room temperature, are inter-related to cause brittle fractures in ultra-high-strength steels. By varying any one of these factors, delayed fracture can be predicted.—**Reported by J. Skarda for Cleveland Chapter.**

Flame Hardening Topic at Detroit

Detroit Chapter's Sustaining Members Night Meeting Featured a Talk on "Flame Hardening" by Virgil B. Bullen of Cincinnati Milling & Grinding Machines, Inc. Shown are, from left: Howard N. Bosworth, chairman; Mr. Bullen; and Robert B. Boswell, technical chairman of the meeting

Speaker: Virgil B. Bullen

Cincinnati Milling & Grinding Machines, Inc.

Virgil B. Bullen, director of laboratories, Process Machinery Division, Cincinnati Milling and Grinding Machines, Inc., spoke on "Flame Hardening" before the **Detroit Chapter** at their recent Sustaining Members' Night meeting. Mr. Bullen presented two color films preceding his talk, "Conquest With Fire" and "Cincinnati Flamatic", the latter illustrating several actual applications of flame hardening equipment.

The basic method of using gas burners for selective heating of parts of different sizes and shapes and their inherent limitations in each case were first discussed by Mr. Bullen. Parts with irregularly shaped surfaces, sudden changes in section size, or blind holes were among those instances cited where application of flame hardening techniques is most difficult. Various types of commercial equipment for flame hardening were described, including one universal machine which could be applied to many different types of flame hardening jobs. The use of flame hardening equipment was shown for hardening such items as cutting edges of tin snips, jaws of pliers and wrenches and the face of clutch plates.

Mr. Bullen proceeded with his discussion by showing illustrations of typical microstructures developed in flame hardened parts, including the transformation zone found immediately below the fully hardened case. He showed the values obtained on taking microhardness traverses through such flame hardened sections and pointed out that little or no drop in hardness occurs just below the fully hardened zone as a result of flame hardening parts which have been previously heat treated.

Charts showing gas consumption rates versus depth of case were presented for methane, acetylene and propane gases. This data indicated that less propane is required to produce a given case depth than is necessary with the other two gases. Typical gas analyses and heat contents of city gas available in several industrial areas in the United States and Germany were referred to in this regard. Mr. Bullen said that in many cities it is necessary or advantageous to use a compressor booster pump to increase the effective gas pressure available to the burners to about 20 psi. He described the design of pumps commercially available for this purpose, and also touched briefly on the design of the flame burners or ports for maximum life and efficiency.

Mr. Bullen concluded by giving typical cost breakdown figures for modern commercial flame hardening operations. One example cited showed that in one plant the cost of hardening a large part, including amortization of equipment and all operation costs, including maintenance, came to a total of $0.48 per piece. In comparison, in another plant producing smaller parts, the total cost per piece was only $0.09. Such cost figures were of course largely dependent on prevailing conditions in each plant as well as location in respect to gas supply. — **Reported by D. V. Doane for Detroit Chapter.**

Talks on Power and Materials Problems

Norman Mochel, A.S.T.M. President, Gave a Talk on "Power and Materials, Now and in the Future" at a Joint Meeting of the Buffalo Chapters A.S.M. and A.S.T.M. Shown, from left, are: R. P. Griffenhagen, A.S.M. chairman; Mr. Mochel, F. Webber, A.S.T.M. chairman; and R. J. Painter, A.S.T.M.

Speaker: Norman L. Mochel
Westinghouse Electric Corp.

Technological advances in building steam turbine generators are one of the biggest factors in lowering the cost of electrical power. The materials engineer has played an important part in these advances, for turbine designers give better materials half the credit for improvements in turbine performance. The **Buffalo Chapter** joined the Buffalo Chapter A.S.T.M. to hear Norman L. Mochel, president, A.S.T.M., and manager, metallurgical engineering, Westinghouse Electric Corp., give a talk on "Power and Materials, Now and in the Future—Some Metals and Materials Problems".

Like metallurgists in many other industries, the steam turbine metallurgist is constantly being pushed by designers for metals which will give satisfactory performance at higher temperatures. Developments in cermets, molybdenum alloys and other high-temperature materials will undoubtedly lead to their use in future steam turbines.

Steam inlet temperatures have been steadily increasing at a rate of approximately 12° F. per yr. and now stand at 1100° F. An inlet temperature of 1350° F. is the goal established for the next 10 yr.

Aside from the development of new materials, the metallurgist has an important responsibility in fabricating a more reliable and economical product. For instance, Westinghouse uses large steel castings to house their turbines. A constant effort to simplify the design of these castings has markedly improved their quality. Other important phases of materials development in the steam turbine field are valve forgings with interior channels forged in instead of machined, and welding and brazing research to keep pace with the new materials.—**Reported by A. E. Leach for Buffalo Chapter.**

Philadelphia Juniors Hear Discussion on Welding and Brazing

Speaker: Arnold Rose
I-T-E Circuit Breaker Co.

Arnold Rose, supervisor of research and development, I-T-E Circuit Breaker Co., spoke before a meeting of the **Junior Section of the Philadelphia Chapter** on "Metallurgy of Welding and Brazing". He discussed metallurgical problems encountered during welding and brazing, explained why they exist, how they occur and how they are solved.

During welding, grain growth can occur if precautions are not taken. As an illustration, Mr. Rose explained how some SAE 1010 steel sheet 0.040 in. thick was welded longitudinally into a cone shape. As the cone was expanded slightly, the part split adjacent to the weld. Microscopic examination showed that grain growth had occurred in the heat affected zone adjacent to the weld.

The explanation was logical. The slight amount of cold work occurring during the cone-forming operation resulted in a critical amount of deformation and the heat of welding accelerated grain growth. The solution was equally logical. After welding, the cone was normalized, thereby refining the grain and on the expansion operation, no more cracking of the weld area was encountered.

During the period when columbium was scarce and Type 347 contained low columbium, whenever this stainless alloy was welded, cracking usually occurred. A study was made and it was found that unless approximately 4% ferrite was present in the dendritic structure of the weld, the welds had a tendency to crack. Therefore, ferrite promoters were added in the form of welding wire and the problem was solved. However, if an excess of ferrite is present, say 10%, sigma has a tendency to initiate.

Mr. Rose then discussed brazing and cited problems involved in the process. The first was solved by using a titanium band around a flange being brazed to a cylinder. Since the brazing alloy would not wet the titanium, brazing was facilitated. The titanium band also acted as a dam, for without it, the brazing ring expanded and had a tendency to fall away from the joint.

Mr. Rose used a simple illustration of the copper-silver phase diagram to explain the liquation problem encountered during brazing. Steel can be brazed easily with the eutectic silver-copper brazing alloy, but when copper is being brazed, if the heating rate is slow or the temperature high, the copper diffuses into the brazing alloy, resulting in a sluggish liquid-solid solution. The result is that the lower melting point constituent flows into the joint by capillary action, leaving a porous shell of the higher melting point constituent.

Mr. Rose stated that the same principles can be used when brazing with the high-temperature nickel-chromium-boron brazing alloy. Because of the large melting range of this alloy, the parts must be heated rapidly through the melting range and then held at the brazing temperature for a minimum of time.—**Reported by Louis F. Calzi for the Philadelphia Juniors.**

Rhode Island Completes Lecture Course on Welding

The **Rhode Island Chapter** recently concluded a very successful course of educational lectures on the subject of "Welding". The attendance was one of the largest in recent years.

The first lecture was given by Allen G. Hogaboom, Bethlehem Steel Co., who spoke on "Survey of Welding Processes". He presented a comprehensive review of welding processes, both past and present.

"Welding of Carbon and Low Alloy Steels", was the title of the second lecture, presented by Helmut Thielsch, metallurgical engineer, Grinnell Co. Sidney Low, Chapman Valve Manufacturing Co., delivered the third lecture on "Welding of Castings". He covered repair welding of castings and fabrication of large castings by welding together small castings.

The fourth lecture was a complete survey of "Mechanical Properties and Testing of Welds" by Mr. Thielsch. The fifth and final lecture, entitled "Distortion and Its Control in Welding" was given by John Mikulak, assistant to vice-president in charge of manufacturing, Worthington Corp.—**Reported by Warren M. Hagist for Rohde Island Chapter.**

Phase Transformation and Chapter Formation Dual Interests at Long Island

Speaker: Morris Cohen

Massachusetts Institute of Technology

Phase transformations and chapter formation were the main topics at a meeting of the **Long Island Activities Committee** of the New York Chapter.

Morris Cohen, Massachusetts Institute of Technology, delivered a lecture on "Control of Metallurgical Properties by Phase Transformations". Examples of precipitation eutectoid and martensitic reactions were used to demonstrate the nature of phase transformations. Dr. Cohen's talk precipitated a prolonged discussion among the 100-odd members attending the meeting.

At the close of the technical session, the Activities Committee circulated a petition for full chapter recognition. The Committee, piloted by Herbert Kalish, Sylvania Electric Products, Inc., believed that the interest shown by the Long Island members warranted a full independent chapter.

The tremendous effort extended by the parent New York Chapter in promulgating the interest in a Long Island Chapter was in a large measure responsible for the Committee's quick action in initiating a petition for full recognition as a chapter. Thanks were voted to National Headquarters A.S.M. for the manner in which it had extended the hand of encouragement and welcome to the budding chapter.

William Rogers and Mr. Kalish, together with Robert Platz, Raymond Stewart and Harold McCullough, were congratulated for the manner in which they organized and ran the activities of the Committee.—**Reported by H. J. Corigliano for the Long Island Activities Committee.**

Tin Plating Advances in Canning Industry Outlined

Speaker: Curtis E. Maier

Continental Can Co.

Curtis E. Maier, general manager, Central Research and Engineering Division, Continental Can Co., spoke on "Flat Rolled Steel and Tin Plate" at a meeting held recently by the **Calumet Chapter.**

Mr. Maier traced the development of the metal container from its infancy in 1900 to the modern methods employed in the industry today.

Prior to World War I, a very small percentage of preserved foods was put in metal containers. The advent of World War I bared the acute need for food preserved in containers that were capable of abuse incurred during intercontinental shipping. To cope with this need, automatic machines were developed to produce cans at the rate of 300 per min. Due to inadequate knowledge of the minimum thermal processes required to attain sterility, canned foods were often overcooked, with a resulting loss of color, flavor and texture.

During the interval between World War I and World War II, great advancements were made in the methods employed in the canning industry, particularly in the use of minimum thermal processes required to attain sterility, the prevention of destruction of vitamins and the prevention of rancidity by the reduction of the exposure of the foods to oxygen in their preparation, as well as by vacuuming and gassing packaging so that canned foods were not only more healthful but were also attractive and palatable. Can production speeds were increased from 300 to 400 cans per min. During the emergency the can industry satisfied requirements for the Armed Forces as well as domestic use with only 25% of the normal amount of tin used prior to World War II, both as a coating for steel as well as for soldering the cans.

Mr. Maier reviewed the possible impact on either the kinds of packaging materials or modifications to existing packages of some of the recently developed new or future possible methods of sterilizing and packaging food products, including nuclear sterilization. In view of the fact that the nuclear radiation levels required to completely sterilize food products cause off flavors and odors in some products and the fact that de-activation of enzymes requires approximately twice the amount of nuclear radiation energy that is required to kill the bacteria, whereas by existing thermal methods the opposite is true, it is likely that low temperature thermal treatments (160 to 180° F.) will be used to deactivate the enzymes prior to the use of nuclear radiation energy to kill the bacteria. In any case, since nuclear radiation sterilization will avoid using the can as a pressure vessel (usually 10 to 15 lb. per sq. in. pressure), it should not only be possible to make cans of thinner tinplate but other packaging materials will be used in increasing quantities, but not with particular impact on the tin plate industry.—**Reported by T. W. Howlett for Calumet.**

Talks on Selecting Steels at Worcester

Present at the Sustaining Members' Night Meeting of the Worcester Chapter Were, From Left: Lincoln G. Shaw, Vice-Chairman; Porter R. Wray, Who Spoke on "New Tools for the Selection of Engineering Steels"; George R. Herpich, Who Outlined the Development of a Central Purchasing Department in a Coffee Talk; Joseph C. Danec, Chairman; and Frederick H. Case, Jr., U. S. Steel Corp. (Photograph by C. Weston Russell for Worcester)

Speaker: Porter R. Wray

U. S. Steel Corp.

At the Sustaining Members' Night Meeting of the **Worcester Chapter,** Porter R. Wray, metallurgical engineer, U. S. Steel Corp., presented a talk on "New Tools for the Selection of Engineering Steels".

Mr. Wray outlined the development of new tools for the selection of engineering steels during the past 15 years. He covered such considerations as operating experience, significance and selection of proper mechanical properties, either from experience or test data under simulated service conditions, fatigue, toughness, fabricating requirements and, finally, the selection of the proper grade of carbon and alloy steels to best fit the needs of an over-all problem. Mr. Wray illustrated his talk with a series of well-selected slides, including a typical mechanical property chart popular a decade ago, and charts illustrating hardenability and its relation to desired physical properties.—**Reported by C. Weston Russell for Worcester.**

Discusses Cold Forming of Steel Sheet

"Cold Forming of Mild Steel Sheet" Was the Subject Discussed by E. F. Lundeen, Inland Steel Co., at a Meeting of the Dayton Chapter. Shown are, from left: I. H. Schaible; Mr. Lundeen; O. B. Reemlin; and E. E. Barney

Speaker: E. F. Lundeen
Inland Steel Co.

E. F. Lundeen, Inland Steel Co., discussed "Cold Forming of Mild Steel Sheet" at a meeting in **Dayton.**

There are two general types of sheet steels used by the industry today, rimming and killed sheet steels. A discussion of the relative merits of each and how these properties are obtained in the mill followed. These sheets may be obtained as hot rolled, pickled or cold rolled. Cold reduction and annealing to attain the physical properties required by the customer were discussed in relation to proper methods of testing. The Rockwell test is used for comparison only. Grain size and tensile strength are the only control tests used to control the ultimate properties of a sheet steel product.

Mr. Lundeen discussed the fabricator's requirements in relation to the mill operations required to produce coil, strip, skin rolled temper, rimmed steel, killed steel and drawing quality steels.

In discussing drawing quality sheet steel, Mr. Lundeen emphasized that this product has to be more or less tailored to the fabricator's product. He further pointed out that a general specification could not be written for this product, because the fabricators have never standardized a method of fabrication.—**Reported by R. A. Koehler for Dayton.**

Heavy Presses and Their Applications Described

Speaker: E. V. Crane
E. W. Bliss Co.

Members of the **Canton-Massillon Chapter** heard E. V. Crane of the E. W. Bliss Co., speak on "Heavy Presses and Their Applications". Mr. Crane has been closely associated in the past with the development of high-production presses used in the manufacture of pressed metal parts. His recent activity has been the development of very large presses for forging light alloys and other special purpose machines of this type.

Mr. Crane illustrated his talk with two motion pictures and numerous slides which showed many types of presses and their operation. One movie showed an automatic press with strip feed into one end and 300,000 can ends per day emerging at the other end. The second movie illustrated the action of a transfer press in which 13 separate operations are performed in succession, a finished stamping being produced with each stroke of the press.

In connection with the slides, Mr. Crane discussed the plastic working of metals in general, emphasizing the differences between thermo-plasticity, or hot working, and crysto-plasticity, or cold working. He recommended that plastic deformation of metals should be studied, using such tools as a plot of true stress versus per cent reduction of area, to make full use of the plasticity shown by each metal.

In conclusion, the speaker showed pictures of 25,000 and 33,000-ton presses and discussed their use for the forging of aluminum aircraft parts.—**Reported by Walter E. Littmann for Canton-Massillon.**

Ultrasonic Testing Methods Given at Tri-City Meeting

Speaker: Charles G. McClure
Sperry Products, Inc.

Charles G. McClure, training school director for Sperry Products, Inc., spoke to the **Tri-City Chapter** on, "Ultrasonic Inspection—Theory, Equipment, and Applications".

Inspection is accomplished by using ultrasonic sound waves, which are produced by special quartz crystals that are caused to emit sound through the excitation of high voltage. Mr. McClure stated that it is possible to examine up to 30 ft. of steel and discover internal flaws which can not normally be discovered by other means. In practice, what is actually measured is time; that is, time for a sound wave to go through an object and then bounce back again. Thus, when a sound wave passes through an object and strikes a flaw, it is returned sooner than it would be if the flaw were not there. It is by this means that imperfections are discovered. Mr. McClure mentioned various methods of examination, and exhibited several different objects to illustrate his talk.—**Reported by Paul Scherbner for Tri-City.**

Phoenix Hears Schaefer on Forgings

The Phoenix Area Chapter Heard Adolph O. Schaefer, National Vice-President A.S.M., Speak on "Heat Treating Medium and Small Forgings". During the meeting, N. F. Ward was presented a 25-year membership certificate. Shown are, from left: Mr. Schaefer; Chairman David S. McLellan; and Mr. Ward. (Reported by Donald A. Rich for the Phoenix Area Chapter)

Past Chairmen Hear History of Aluminum

G. M. Young, Aluminum Co. of Canada, Ltd., Spoke on "Aluminum" Before Past Chairman's Night of Inland Empire Chapter. Present were past chairmen, from left, front: L. J. Barker (1951); S. A. Duran (1952); Mr. Young; G. S. Fergin (1953); and F. M. Krill, present chairman. Back row, from left, are: J. G. McGivern (1944); W. Z. Davis (1947); C. R. St. John (1948); G. A. Carske (1948); and J. M. Marchi (1949)

Speaker: G. M. Young

Aluminum Co. of Canada, Ltd.

G. M. Young, technical director, Aluminum Co. of Canada, Ltd., and A.S.M. Trustee, briefly reviewed the history of "Aluminum" at a meeting of the **Inland Empire Chapter.** He described the development of aluminum alloys by investigators and researchers through their efforts to obtain a harder form of this light metal and to improve its working properties and corrosion resistance.

First regarded as only a jewelry metal, the earliest aluminum alloy was used for casting artistic articles. It contained 2% copper. Silicon alloys were discovered by accident when remelting aluminum with a flux in clay or glass crucibles. Early researchers also experimented with cladding nearly 75 years before marketing of the first aluminum alloy clad product. Aluminum readily alloys with most common metals but, while one element may enhance certain properties if alone, in the presence of others with their complex formation of constituents, these properties may be somewhat altered. However, it has been found that additions of copper, magnesium, silicon and zinc all contribute to improved mechanical properties, either with or without heat treatment, while elements such as iron, manganese and particularly nickel, are valuable in compositions for elevated temperature applications. Also, copper, magnesium and silicon improve fluidity, and hot shortness on freezing is considerably reduced by additions of copper, iron, manganese, nickel and silicon.

Casting alloys were first to come into commercial use, but wrought alloys were not far behind and often differ from the casting compositions only by changes necessary for hot and cold working.

In 1909 the process of age hardening alloys was discovered; about seven years later magnesium silicide was found to act as a hardener and further hardening was induced by elevated temperatures or artificial aging. This led to the development of new, heat treatable alloys, and the years of research during two world wars introduced high-strength alloys for aircraft which have resulted in a multitude of peacetime uses.

A wealth of knowledge on alloying has thus been provided and is the key to further research on new and better aluminum alloys.—**Reported by Helen Goerig for Inland Empire.**

Purchasing of Metals to Specifications Explained

Speaker: Charles M. Parker

American Iron and Steel Institute

Charles M. Parker, assistant vice-president of the American Iron and Steel Institute, was to present a paper on "Purchasing Metals Specifications" at a meeting of **Dayton Chapter** held jointly with the local chapter of the Purchasing Agents Association. Since Mr. Parker was unable to attend this meeting, David C. Heckard, Dayton executive committee, read Mr. Parker's paper.

An explanation of the six fundamental methods of purchasing steel and the benefits and limitations to be expected from each was presented. Purchasing steel by chemical composition limits, hardenability limits, mechanical property ranges and formal specifications were covered.

The author illustrated, through a discussion of steel mill practices, the reasons for the many requirements of specifications. The entire discussion focused on the pertinent questions, what is steel quality? and what provisions are taken in the steel mills to insure the integrity of their products?—**Reported by R. A. Koehler for Dayton Chapter.**

Describes Shatter Cracks in Steel at Meeting in Peoria

Speaker: H. B. Wishart

U. S. Steel Corp.

Members of **Peoria Chapter** heard a talk on "Shatter Cracks in Steel" by H. B. Wishart, chief metallurgist, United States Steel Corp., Gary, Ind.

The origin and detection of shatter cracks in rail steel were discussed by Mr. Wishart. He pointed out that the current theory centers around the presence of hydrogen gas dissolved in the steel. This has been demonstrated by artificially administering hydrogen to an ingot before solidification. Samples taken from suspected heats are allowed to age for several days, to develop for fractures, then are macroetched for examination.

Preventative measures for shatter cracking usually take the form of slow cooling at the time of fabrication by the mill. Mr. Wishart's talk was illustrated by an excellent set of slides.—**Reported by J. G. Frantzreb for Peoria Chapter.**

Long Island Chapter Receives Charter

National President George A. Roberts (Right, Standing) Is Shown Presenting the Charter of the Newly Organized Long Island Chapter to Herb Kalish (Left), Chairman, Walter Stadtler and George Stradar

The **Long Island Chapter** received its charter at a meeting held recently. The meeting was opened by H. Kalish, the chairman, who introduced National President George A. Roberts. Dr. Roberts presented an excellent pre-program warm-up of metallurgical stories and wound up the introduction by presenting the Chapter with its new charter.

Dr. Roberts was well informed about the Long Island Chapter's activities and commended the intense efforts expended by the officers and executive board members of this activity over the past several months. The growth of the Long Island Area and the migration of technical industries and personnel warranted the formation of a chapter devoted to presenting important timely lectures and providing a neighborhood place for holding meetings.

Walter A. Stadtler, present chairman of the New York Chapter, which is referred to by Long Island as the "mother" chapter, expressed his sincere wishes for success and indicated that the cooperative spirit which has existed between the two groups will be continued in the future. The talents of the New York Chapter provided the start of the Chapter, and the services of Neal Russel and H. Kalish were especially helpful in initiating the Long Island group.

Dr. Roberts' participation in the ceremonies did not culminate his offering to the evening. He was called upon by George Stradar, technical chairman, to deliver a lecture on "Properties and Structure of Alloy Toolsteels". For the second time that evening, Dr. Roberts proved his prowess for public speaking did not outshine his understanding of the field of toolsteels as used in industry.

Dr. Roberts discussed the comparative physical properties of various alloy toolsteels containing more than 5% alloying element. Wear resistance, toughness, hot hardness and other characteristics were completely covered. The metallography of the steels was presented and demonstrated with the aid of lantern slides.

Approximately 100 members were on hand for the festivities and to hear the technical discussion. The slate for next years officers and executive committee was presented at the close of the meeting.—**Reported by H. J. Corigliano and H. Liebling for Long Island Chapter.**

OBITUARIES

WALTER A. FLETCHER, sales manager of the Western Division of E. F. Houghton & Co. for the past 14 years, died in San Francisco early in April. He had been in sales work with Houghton on industrial oils, chemical and mechanical leathers since 1922, in Erie, Pa., and was appointed sales manager in the San Francisco office in 1941. Mr. Fletcher served on many committees for the Golden Gate Chapter.

C. J. FERGUSON and HARRY VAIL were both killed in a turbine explosion at the local mill of the Abitibi Power and Paper Co. Ltd., Sault Ste. Marie, Ont. Mr. Ferguson was a member of the Northern Ontario Chapter and Mr. Vail a former member A.S.M.

FRED O. REESE, warehouse metallurgist, Atlantic Steel Co., died early in April. Fred had served on the Georgia Chapter as publicity and educational chairman.

Vacuum Metallurgy Is Topic at Rochester

R. G. Ulrech, Chief Metallurgical Engineer, Consolidated Vacuum Corp., Spoke on "Application of Vacuum to Metallurgical Operations" at a Meeting Held in Rochester. Shown are, from left: Leon Kimpal, vice-chairman; Dr. Ulrech; John Hoffer, chairman; and Robert Guinan, past chairman

Speaker: R. G. Ulrech
Consolidated Vacuum Corp.

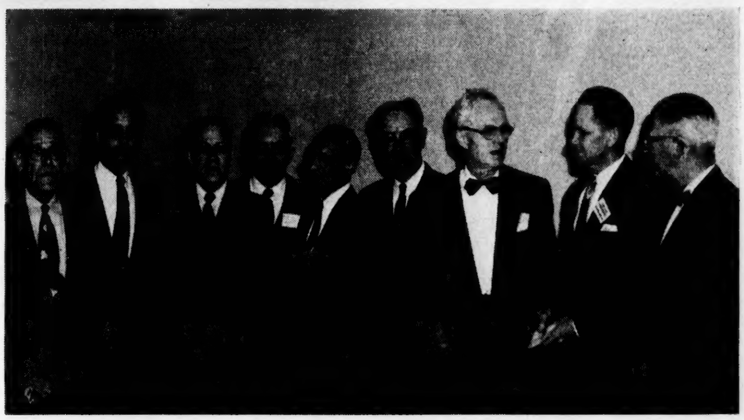
Members of the **Rochester Chapter** heard a talk on "Application of Vacuum to Metallurgical Operations" presented by Robert G. Ulrech, chief metallurgical engineer, Consolidated Vacuum Corp., at a recent meeting.

Today, vacuum processed metals are common to industry in terms of high-temperature, high-purity alloys. By processing metal alloys in the absence of oxygen and other gases, it is possible to greatly improve such physical characteristics as tensile strength, ductility, forgeability, fatigue strength and fatigue resistance. As an example, the fatigue strength of a vacuum melted alloy type M252 was improved by a ratio of 50 to 1 over the same air melted alloy.

A portion of Dr. Ulrech's presentation included slides and a description of representative CVC vacuum furnace designs sold to such leading metals producers as the International Nickel Co., the Carboloy Dept. of General Electric Co., and the Research Laboratory of Westinghouse Electric Co.

Old Timers Honored at Rockford Chapter

Rockford Chapter Honored 17 Men Who Have Been Members for Over 25 Years. Also designated as Herb Habecker Night, the Chapter Presented Herb, Who Has Been Secretary for 16 Years, an Honorary Life Membership (Shown at Right). Pictured are, top, from left: R. M. Smith, Mr. Habecker, E. H. Ericson, A. Lien, U. H. Gillett, C. V. White, J. B. Frederick and J. Burns, Below, from left: J. L. Rossier, C. H. Muehlemeyer, H. Devine, W. Olson, L. J. Strohmeyer, W. K. Young, O. Olson, F. Anderson and A.C. Mattison



Modern Forging Techniques And Applications Subject At Chattanooga Meeting

Speaker: Waldemar Naujoks

Globe Forge, Inc.

Members of the **Chattanooga Chapter** heard an illustrated talk on "Modern Forging Techniques and Machinery" at a recent meeting. Using slides to illustrate his lecture, Waldemar Naujoks, vice-president and general manager, Globe Forge, Inc., traced the history of forging back to the time when artisans worked at anvils with sledge hammers. These primitive forges were often in caves where natural air drafts could help keep the fires glowing. With the advent of water power in the 13th century, the first mechanical drop forge hammer came into use, then steam power took over in the 19th century. These early forge hammers were used for simple pieces; man had to wait for the use of dies with cavities before forges could put out reproducible parts in quantity.

The modern automobile and aircraft industries have given forging its greatest impetus and modern forging practice has developed the horizontal forging machine. Mr. Naujoks explained that the drop hammer forges are rated as to weight of the ram, while the forging machine is rated as to diameter of stock it is capable of upsetting. A recent German introduction to forging has been the drop hammer with the die being raised to meet the hammer.

A basic law of forging illustrated by Mr. Naujoks, is that, when forged, metal flows so as to follow lines of least resistance. He then presented illustrations of typical forged forms and etched samples showing flow lines inside the forged pieces.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Fatigue of Metals Theme Of Talk at Dayton Chapter

Speaker: J. D. Graham

International Harvester Co.

Some of the newer concepts of "Fatigue and Fatigue Failure" were discussed by J. D. Graham, International Harvester Co., at a meeting of the **Dayton Chapter.**

The basic fundamentals of why steel parts fail might be summed up in the simple concept of stress and strain. The origin of failure is often found, after diligent search, to be a stress area that is not compatible with the surrounding area. This concept might well be best illustrated through the study of residual stresses in a given part.

Mr. Graham elaborated on the simple concept of tensile strength and how it could be applied at the grain boundries of a material. Although probably of such an infinitesimal amount that could not be measured through instrumentation, these forces react to cause ultimate failure of a seemingly sound part.

Mr. Graham's discussion then led into the design causes of fatigue failure. Probably the most common error in design is the lack of ample fillet radius for a given part. Notch effect and sudden change in section constitute what is more commonly known as stress risers.

Mr. Graham summarized his discussion on this subject by showing and explaining the "case history" by an excellent set of slides of fatigue failures.—**Reported by R. A. Koehler for Dayton.**

owns and operates the National Metal Exposition, the largest annual industrial exposition in America.

Presents Sauveur Lecture in Boston

Daniel J. Martin (Right), Is Shown Receiving the Sauveur Memorial Award From John L. Morosini, Vice-Chairman of the Boston Chapter. Dr. Martin presented a talk entitled "Metallurgical Problems in Oil Well Drilling"

Speaker: Daniel J. Martin
Hughes Tool Co.

Daniel J. Martin, vice-president and director of research and engineering, Hughes Tool Co., presented the annual Sauveur Memorial Lecture of the **Boston Chapter.** The subject was "Metallurgical Problems in Oil Well Drilling". Dr. Martin, who studied under Prof. Albert Sauveur at Harvard University, discussed problems relating to design and manufacture of drilling bits and drill stem members, and illustrated typical failures encountered in service. He closed his lecture with an eloquent tribute to his former teacher who was the first man in America to look through the microscope at a specimen of steel.

In view of the limitations placed upon the size of drilling bits and component parts, it is necessary to employ carefully selected materials and heat treatments to withstand the severe conditions imposed in service. Resistance to erosive action of mud, and ability to penetrate hard rock formations such as quartzite, are among the requirements which must be met. Complexity of the problem is multiplied by the need for more than 500 sizes and types of bits to fill the requirements of the industry.

Discussing drill pipe, Dr. Martin outlined the specified physical properties and discussed various designs of tool joints. Flash welded joints have offered superior service life compared to threaded joints which are particularly susceptible to fatigue failure. Typical failed parts showing progressive fatigue at the last thread were illustrated. Threaded joint failures resulting from wash out by mud erosion, and failure by galling were also shown. Electroplating with copper or zinc has been found helpful in preventing galling action. Of interest were slides showing impact failures attributed to temper brittleness of the steel, and longitudinal splitting due to inclusions.

Hard facing by selective carburizing or use of a carbide insert is employed to advantage in extending the life of drill bits and drill stem members. Examples are tungsten carbide nozzles, carburized 8720 steel bearing ring, carbide wear bands for tool joints and selectively carburized teeth on rock bits.

Progressive wear of rock bits was illustrated from initial manufacture to final failure. The speaker emphasized that actual service life varies widely according to rock formation. For example, ultimate wear life may be reached after drilling 5000 ft. in 30 hr. or 4 ft. in 6 hr.

Referring to the pioneering efforts of Prof. Albert Sauveur in laying the groundwork of metallography in America, Dr. Martin mentioned Sauveur's 100-page technical paper written in 1896, "Microstructure of Steel and Current Theories of Hardening", still a lively topic in 1955.

In a tribute to Prof. Sauveur, Dr. Martin said:

Sauveur's work was basic and a great deal of what we do today would be impossible without his ideas and fundamentals. He was also a great teacher. His students, and his students' students can certainly be said to have played a greater part in present knowledge of the physics of metals than any other group, not only here but in the world. His book, "The Metallography and Heat Treatment of Iron and Steel", has long been a masterpiece of metallurgical literature and surely, no metallurgical library worth the name is without it. He was a patient, sympathetic, untiring and inspiring instructor, yet he was always modest and humble concerning his own knowledge and ability. During an academic apprenticeship or an academic career, we all have met outstanding instructors, brilliant scholars and capable research men; but only once or twice in a lifetime are these formed in proportions to make a real teacher, which is most certainly what Sauveur was.

Sauveur was also a great man. He was a thoughtful and loving husband. He was a kind and generous father. He was a distinguished and respected citizen and a real friend of those who knew him. I am deeply moved, I am highly appreciative, and I feel greatly honored to have been chosen to help pay tribute to the memory of my dear friend and teacher, Albert Sauveur.—**Reported by M. B. Graham for Boston.**

Members of Dayton Chapter Visit Morris Bean & Co.

Members of the **Dayton Chapter** visited Morris Bean & Co. during a recent meeting. Morris Bean & Co. is engaged in making precision aluminum castings for the government and large corporations. Most of their castings are for parts connected with the transmission of energy or precision parts of engines (torpedo wheels, guided missiles and aircraft engines). Moldings are also a major product. The company makes more tire moldings than all other companies in the world combined.

This is truly an example of a successful small business that started as a college research project and grew into a $2.5-million business.—**Reported by R. A. Koehler for Dayton Chapter.**

created the Annual Teaching Award in Metallurgy, open to teachers of Metallurgy in the United States and Canada. Value $2000.

Explains Brittle Fracture Problems

"Metallurgical Aspects of the Brittle Fracture Problem" Were Discussed by W. S. Pellini, Naval Research Laboratory, at the Sustaining Members Night Meeting of the Pittsburgh Chapter. Shown are, from left: J. Heuschkel, Westinghouse Electric Corp., Mr. Pellini, and Chairman P. Wray

Speaker: W. S. Pellini
Naval Research Laboratory

Sustaining Members Night of the **Pittsburgh Chapter** featured a talk by W. S. Pellini, superintendent, Metallurgy Division, Naval Research Laboratory, on "Brittle Fracture."

Mr. Pellini reviewed briefly the history of brittle fractures, which were first observed in bridges and ships which failed in Europe during the late 1930's, but, for the most part, the true significance of these failures was not recognized at the time. In general, they were attributed to poor steel and little research was carried out. During World War II, when great numbers of ships were being fabricated by welding, several catastrophic failures were encountered, and brittle fractures have since been the subject of intensive study. While there are still a good many phases to the problem that are not completely understood, much has been learned and empirical solutions have been formulated for the guidance of the engineer who must proceed with design and manufacture of equipment to operate under conditions where brittle failures have been encountered in advance of the final scientific solution.

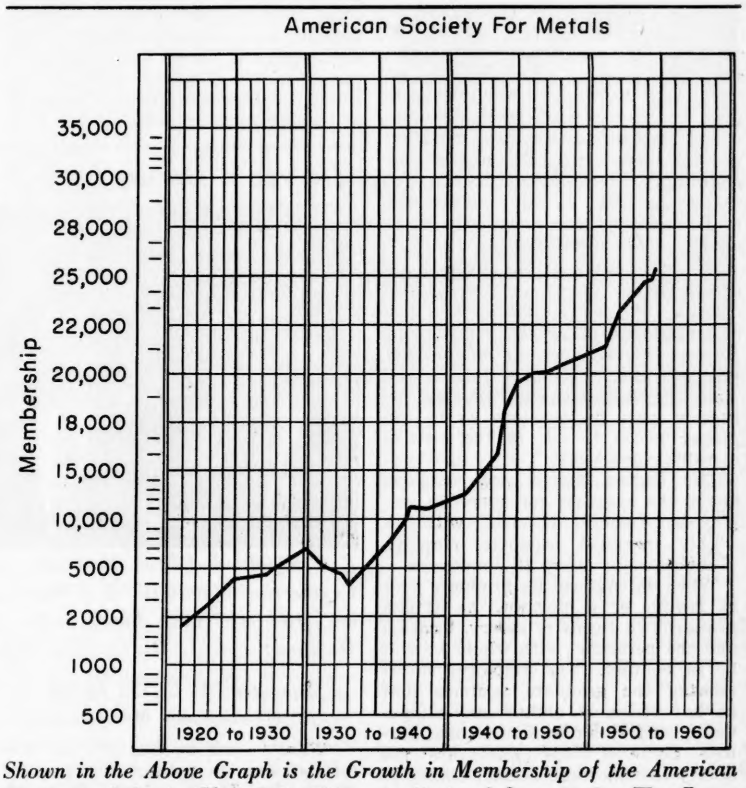
It has been established that when cracks are initiated in structural steel members under conditions where yielding and flow cannot occur, the crack will propagate rapidly with catastrophic results. Crack propagation speeds have been measured up to 6000 ft. per sec.

Two critical transition temperatures should be recognized in connection with the problem of brittle fracture—one is a transition for initiation of fracture and the other a transition for propagation of fracture. For conventional service, the initiation transition controls while for severe loading conditions involving the application of plastic loading, the fracture propagation transition is the controlling factor. For all steels investigated, there is a temperature (transition) below which yielding is not possible in the presence of a sharp, notch-like flaw; the metal will initiate fracture in preference to developing deformation.

The fracture propagation transition occurs at approximately 30 to 40°/F. above the transition for initiation. Above this temperature fractures will not propagate through elastic-loaded regions even though starting was "forced" by the application of deformation locally at the location of the notch.

The actual values for the transition temperatures vary widely, depending on many factors, among which are chemical composition and microstructure. For example, it has been learned that steels having a quenched and tempered microstructure have lower transition temperatures than the same steels with normalized or pearlitic structures.

Numerous tests have been used in studying the brittle fracture problem, among them the explosive loading, dropweight and Charpy impact tests. The explosion loaded plate method has yielded a great deal of information, but has the disadvantage that it is fairly expensive. The drop test is simple and inexpensive to conduct. In both of these tests, the crack is usually initiated by welding a small bead of hard facing material on the surface of the plate to be tested. This cracks with the initial very slight deformation and provides a notch of infinite sharpness, which may or may not penetrate into the balance of the material, depending on the properties of the test material. It has been found that the Charpy V impact test can be correlated with other results quite satisfactorily, but that the Charpy keyhole test is much less satisfactory. **—Reported by J. A. Cameron for Pittsburgh.**



Shown in the Above Graph is the Growth in Membership of the American Society for Metals Since 1920, When the National Organization Was Formally Established, Up to the Present Time. Except for the lean years of the early 1930's membership has increased yearly since 1920, when there were 1724 members, to the midyear figure for 1955, of over 25,000

Detroit Presents University Night

Shown at the Detroit Chapter's University Night Are, From Left: C. R. Biddick, Technical Chairman; H. N. Bosworth, Chairman; and W. Scott Hill, General Electric Co., Who Spoke on "Industry and the Young Engineer". Professors, seniors and graduate metallurgical students from University of Michigan, Michigan State University, University of Detroit, Lawrence Institute of Technology and Wayne University were guests of the Chapter

Speaker: W. Scott Hill
General Electric Co.

W. Scott Hill, head of engineering recruiting section, General Electric Co., presented a talk entitled "Industry and the Young Engineer" at the **Detroit Chapter's** University Night.

Mr. Hill opened his talk with the question uppermost in the minds of most young engineering graduates, "What is in prospect for me?" To answer this question, he stated that of the 19,800 engineers graduated last year, only 500, or 0.2%, were in metallurgy. Mr. Hill stated that 2.5% of all B.S. engineering degrees are in metallurgy, while 3.5% of the M.S. degrees and 9% of the engineering Ph.D. degrees are conferred for metallurgical accomplishments.

Mr. Hill indicated the importance of competent engineers for making decisions in the purchasing and use of metals and materials. At General Electric alone, over $1 billion per year is spent for purchased materials. And, the metallurgist plays an important part in decisions as to the proper metal to use in the critical metallic components.

The United States now employs about one engineer for every 60 employees. General Electric, with its highly technical products, employs 1 engineer for every 15 employees.

When an engineering graduate goes in search of a position, he thinks primarily in terms of salary, location and the personnel with whom he will be in contact. The employer interviewing the graduate assumes that he has technical ability and competence, and looks to more basic factors. Some of these factors are: the ability to select and decide; ability to communicate ideas effectively to others; willingness to work, or less briefly, "something needs to be done, why not I?", rather than "Why should I?"; sincerity, to mean what you say; creativity, the imagination to envision present or future projects; sensitivity to the importance of human relations; adaptability, the characteristic that allows you to fit into unexpected situations or problems; motivation, including a built-in "self-starting" ability as applied to a project, or a career; stamina to finish what is started. Other characteristics include appearance, courage, judgment and breadth of understanding.

At General Electric, examples of work which metallurgists are engaged in include responsibility for the new jet alloys, magnetic materials and alloys for guided missiles where weight and temperature are contributing factors. In the nuclear energy field, the effect of neutron bombardment on metals urgently requires a new understanding of metallurgy. Mr. Hill pointed out the need for metallurgists in such widely diversified fields as radiation laboratories, the cemented carbides and radar components.

The speaker pointed out the several fields open to recent metallurgical graduates. For research, the man with a Ph.D. degree is concerned with theoretical properties, reactions and behavior of metals and the development of metals to meet the needs of design engineers. That man in applied research studies properties and uses of metals. This field includes the work of the development metallurgist. Lastly, production metallurgists control metals in processing and working for everyday fabrication of products. Persons in any of the above fields can and have gained high administrative and even national prominence, but they generally begin their careers as specialists with sound fundamental knowledge in their own profession.

Mr. Hill gave a few reasons why engineering personnel sometimes fail to realize their potentiality. Included among these are failure to set objectives, inability to find a good leader and inability to think clearly. One formula for measuring individual success given by the speaker was that realization divided by expectation approximates a degree of success.—**Reported by C. R. Biddick for Detroit.**

Dayton Brought Up-to-Date on Materials

T. C. DuMond, Editor, Materials and Methods, *Spoke on "What's New in Engineering Materials" at a Meeting Held by the Dayton Chapter. Shown are, from left: Eddy Lamb, coffee speaker; I. H. Schaible, chairman; Mr. DuMond; and J. D. Loveley, who is a past chairman of the Chapter*

Speaker: T. C. Du Mond
Materials and Methods

"What's New in Engineering Materials" was the subject discussed by T. C. Du Mond, editor, ***Materials and Methods,*** in **Dayton.**

Mr. Du Mond's discussion dealt primarily with recent developments in materials, covering not only metals but plastics and nonmetallics as well. He devoted much of the discussion to explanations of new ways in which materials are being used, new processes and refinements of old processes to make use of new materials. In conclusion he discussed an approach to solving the materials problems of industry today. — **Reported by R. A. Koehler for Dayton.**

Powder Metallurgy Subject at New York

C. Robert Talmage, Consultant, Led a Discussion on "Powder Metallurgy" Before the New York Chapter. Shown are, from left: Herbert Kalish, chairman, Long Island Activities Committee; Kempton H. Roll, technical chairman of the meeting; Mr. Talmage; Walter A. Stadtler, chairman of the New York Chapter; and John R. Nielsen, New York vice-chairman

Speaker: C. Robert Talmage

Consultant in Powder Metallurgy

A basic discussion of "Powder Metallurgy—A New Way of Forming Metal Parts" was featured at a recent **New York Chapter** meeting. The speaker was C. Robert Talmage, consultant in powder metallurgy.

Mr. Talmage approached his subject in an unusual way. By centering attention on an actual production part, a clock part now being made by the hundreds of thousands, he developed a concrete and detailed picture of what can be accomplished by powder metallurgy.

The part selected is an alarm verge hammer being made by and used by the Lux Clock Manufacturing Co. This sintered steel part has replaced a part made by conventional stamping and machining methods at cost savings of about 80%.

In addition to making direct cost comparisons and pointing out other benefits gained by redesigning for powder metallurgy, Mr. Talmage gave complete details on materials and fabricating techniques. He also exhibited several interesting parts recently put into production, including complex clock parts, gears and experimental piston rings.

Some up-to-date statistics of the powder metallurgy industry were presented by Kempton H. Roll, technical director of the Metal Powder Association, in his introduction of the guest speaker.

Shipments of iron powder were 33% higher last year than in the previous year, Mr. Roll said. Although much of this growth is due to some of the newer uses, such as flame cutting and coated electrodes, some of the increase must be attributed to broadening use of metal powders to form metal parts. Despite this growth, Mr. Roll said, domestic production capacity for iron powder is currently considerably greater than demand. — **Reported by John B. Campbell for New York.**

Welding Topic of Course

The **Canton-Massillon Chapter** has recently completed a series of educational lectures on "Welding". Attendance of from 210 to 225 was registered for each lecture.

The course consisted of five lecture periods. Included were talks on: Welding Fundamentals, by N. C. Jessen, welding engineer, Babcock & Wilcox Co.; Hard Facing and Spray Welding, by Vernon A. Tucker, Crucible Steel Co. of America; Miscellaneous Specialized Welding Electrodes, by Hallock C. Campbell, Arcos Corp.; Welding of Stainless Steel and Automatic Welding, by R. K. Lee, Alloy Rod Corp. and General Review, by R. K. Kewley, Lincoln Electric Co.

James F. Lincoln's Arc Welding Foundation book, "Metals and How to Weld Them" was used as a text.

The facilities, consisting of a local school auditorium, were very good for the size of classes which attended the lectures and the Chapter hopes to be able to continue to supply educational lectures of this type since both industry and the individual personnel in the Canton-Massillon District have expressed an interest and need for them.—**Reported by F. J. Welchner for Canton-Massillon.**

Receives Penn State McFarland Award

John A. Succop (Left), Chief Metallurgical Engineer for Heppenstall Co., Was Presented With the David Ford McFarland Award for Achievement in Metallurgy in 1955 by M. J. Mianulli (Right), Chairman of the Award Committee, Penn State Chapter. Looking on is President Robert B. Heppenstall

Speaker: John A. Succop

Heppenstall Co.

The seventh annual David Ford McFarland Award was presented to John A. Succop, chief metallurgical engineer, Heppenstall Co., at a banquet meeting of the **Penn State Chapter.** M. J. Mianulli, chairman of the award committee, presented a hand-lettered certificate to Mr. Succop. George A. Roberts, national president, was master of ceremonies.

Following the presentation ceremonies, Mr. Succop delivered an address on the "Development of a Die Block for Closed Die Forging". The installation of large forging presses ranging up to 50,000-ton capacities presents a challenge to alloy steel manufacturers who supply material for die blocks. The speaker explained the history of die block development up to the present and compared the improved alloys of today with those previously used. The properties which these special alloys must possess to meet present-day requirements were clearly explained and illustrated with lantern slides. **—Reported by Richard Atkinson for the Penn State Chapter.**

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering. Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A

General Metallurgical

57-A. Industrial Waste Control. D. Gardner Foulke. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 63-65.

Research being devoted to problem of stream pollution abatement. (A8, L17)

58-A. History of Gun Tubes. III. Steel for Cannon. Peter R. Kosting. *Metal Progress,* v. 67, Apr. 1955, p. 109, 12 pages.

Comparison of cast iron vs. steel tubes. Transition era of cast iron to steel. Modern development of steel guns. Diagrams, tables. 27 ref. (A2, T2, ST)

59-A. Do's and Don'ts in Plating Operations. Charles Bueltman. *Metal Finishing,* v. 53, Apr. 1955, p. 40-47, 55.

Use of ion exchange equipment for treating rinse water and plating wastes. Graphs, diagrams, tables, photographs. 18 ref. (A8, L17)

60-A. (German.) **Selenium, an Important Basic Material for Industrial Production.** Wilhelm von Haken. *Chemische Industrie,* v. 7, no. 3, Mar. 1955, p. 93-96.

Scarcity and increased costs are hindering technical progress. 2 ref. (A4, Se)

61-A. Dust and Fumes From Gray Iron Cupolas—How They Are Controlled in Los Angeles County. Hoyt R. Crabaugh, Andrew H. Rose, Jr., and Robert L. Chass. *Air Repair,* v. 4, Nov. 1954, p. 125-129; disc., p. 129-130.

Engineering evaluation necessary for the determination of proper types and designs of control equipment. Tables, photographs. (A8, E10)

62-A. Air Pollution: Furnace Types and Sizes Dictate Most Effective Controls. I. N. R. Shaffer and M. A. Brower. *Iron Age,* v. 175, Apr. 28, 1955, p. 100-102.

Regulations, methods, equipment and costs required for air pollution control. Photograph, tables. (A8)

63-A. Dual Disposal System Fully Neutralizes Plating Wastes. W. G. Patton. *Iron Age,* v. 175, May 5, 1955, p. 102-104.

Automatic waste disposal system in the automobile industry to destroy cyanide and neutralize acid-alkali waste. Photographs. (A8, L17)

64-A. Air Pollution: Furnace Types and Sizes Dictate Most Effective Controls. II. N. R. Shaffer and M. A. Brower. *Iron Age,* v. 175, May 5, 1955, p. 110-112.

Uncontrolled emissions of dust and fume from gray iron cupolas can add significantly to community "smog" problems; with proper control methods this type of atmospheric contamination can be reduced by more than 95%. Tables, photographs. (A8, E10)

65-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 22, Apr. 1955, p. 167-174.

From "pigging-up" to "platinum-tungsten alloy". Diagrams, photographs, tables. (To be continued.) (A10)

66-A. Titanium's Future Looks Bright Despite Major Roadblocks Now Being Overcome. Walter L. Finlay. *Western Metals,* v. 13, Apr. 1955, p. 48-50.

Scarcity, technical difficulties, design properties and cost. Photographs, graphs, tables. (A4, Ti)

67-A. (German.) **The European Steel Market in 1954.** H. W. A. Waring. *Stahl und Eisen,* v. 75, no. 8, Apr. 21, 1955, p. 445-452.

Raw materials, production statistics, competition of other materials, technical developments, outlook for 1955. (A4, ST)

68-A. (Book—Spanish.) **General Metallurgy.** Emilio Jimeno and F. R. Morral. v. I-II. 1324 p. 1955. University of Madrid, Madrid, Spain.

A comprehensive treatment of physical and extractive metallurgy; ore dressing; properties; alloying; powder metallurgy; welding; corrosion; structures. (A general)

B

Raw Materials and Ore Preparation

78-B. Extraction of Uranium From Ore Concentrate. H. Chr. Neeb and K. Stokland. *Henry Brutcher Translation No.* 3474, 19 p. (From *Forsvarets Forsknings, Institutt Arbok III,* 1950-1951, p. 3-16.) Henry Brutcher, Altadena, Calif.

Plant design; processing steps. Diagrams. (B14, C general, U)

79-B. The Chemical Theory of Flotation. P. L. de Bruyn. Paper from "Mineral Engineering Techniques". American Institute of Chemical Engineers, p. 5-14.

Flotation circuits and systems. Flotation agents including collectors, activators and depressants. Diagrams, table. 20 ref. (B14)

80-B. Fundamentals and Applications of the Liquid Cyclone. Donald A. Dahlstrom. Paper from "Mineral Engineering Techniques". American Institute of Chemical Engineers, p. 41-61.

Basic theory; operating experience. Photographs, diagrams, tables, graphs. 39 ref. (B14)

81-B. (German.) **The Use of Beryllium in Light Metals.** E. A. Smith, Jr., and E. A. Giessen. *Metall,* v. 9, nos. 5-6, Mar. 1955, p. 198-199.

Beneficial effects on properties of aluminum alloys and aluminum dip coatings on steel and other iron alloys. Photograph, graph. 7 ref. (B22, Q general, L15, Be, Al, ST, Fe)

82-B. Effect of Fine Particle Sizes on Sulfide Flotation. Arthur P. Wichmann and Roshan Boman Bhappu. *Colorado School of Mines, Quarterly,* v. 50, Apr. 1955, 37 p.

Effect of fine particle sizes of quartz, kaolin and galena are identical in many respects. Finer sizes of these minerals cause a gradual falling off in grade and recovery of the sulfide. Tables, graphs. 14 ref. (B14)

83-B. (Czech.) **Ore Pelletizing Process.** B. Sewerynski and T. Wlazinska. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 24-29.

Survey of foreign literature concerning theory of pellet formation. Graphs. 5 ref. (B16)

84-B. (Czech.) **Hardening Process of Iron Ore Pellets.** B. Sewerynski and T. Wlazinska. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 30-34.

Factors and conditions essential for hardening of pellets. Graphs, micrographs. 6 ref. (B16, Fe)

85-B. (French.) **Study of the Desulphurization, by Agglomeration Over a Grill, of a Barytic Iron Ore.** J. Astier. *Revue de métallurgie,* v. 52, no. 1, Jan. 1955, p. 47-62; disc., p. 62.

Results of tests to determine optimum conditions for desulphurization of Khenifra iron ore. Tables, diagrams, graphs. 22 ref. (B14, Fe)

86-B. (German.) **Wet Processing of Oxidized Copper Ore by the "Compania Minera Sali Hochschild" in Copiapo, Chile.** Walter Wendt. *Berg- und hüttenmännische Monatshefte der montanistischen Hochschule in Leoben,* v. 100, no. 2, Feb. 1955, p. 109-112.

Method, optimum conditions, per cent of recovery. Flowsheet, diagram. (B14, Cu)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

87-B. Reserve's E. W. Davis Works Installs New Heat Hardening Process for Taconites. *Journal of Metals,* v. 7, Apr. 1955, p. 538-539.

Heat hardening of taconite pellets promises easy quality control, minimum breakage and operating simplicity. Photographs, flowsheet, table. (B16, Fe)

88-B. J & L Pilot Plant Successful. Development Adds to Ore Supply. *Steel Equipment & Maintenance News,* v. 8, Apr. 1955, p. 16-17.

Nonmagnetic ores can be rendered magentic and then concentrated by simple magnetic separation. Diagram. (B14, Fe)

89-B. (Book.) **Metallurgy of the Non-Ferrous Metals.** W. H. Dennis. 647 p. 1954. Sir Isaac Pitman & Sons, Ltd. Pitman House, Parker Street, Kingsway, London, W.C. 2, England. 70/-net.; Pitman Publishing Corp., 2 West 45th Street., New York 19, N. Y.

Extractive metallurgy with brief references to properties and applications.
(B general, C general, EG-a)

90-B. (Book.) **Mineral Engineering Techniques.** F. J. Van Antwerpen, editor. Chemical Engineering Progress Symposium Series, no. 15, v. 50. 96 p. 1954. American Institute of Chemical Engineers, 25 West 45 Street, New York 36, N. Y.

Symposium on ore beneficiation equipment and methods. Pertinent papers are individually abstracted. (B general)

C

Nonferrous Extraction and Refining

65-C. Production of Zirconium Alloys by Consumable Electrode Arc Melting. R. A. Beall, J. O. Borg and H. L. Gilbert. *Electrochemical Society, Journal,* v. 102, Apr. 1955, p. 187-192.

Equipment and conditions of operation involved in double melting; discussion of homogeneity, purity, and effective yield. Diagrams, tables, photographs. 10 ref. (C21, Zr)

66-C. Attempts to Improve Aluminum Reduction Since Héroult and Hall. A. von Zeerleder. *Institute of Metals, Journal,* v.83, Mar. 1955, p. 321-328.

Surveys attempts made during the last 60 yr. to find improved method of producing aluminum on commercial scale. It is concluded that none can compete economically with the most modern version of the Hall-Héroult-Bayer process. Diagrams, tables, flowsheets.
(C general, Al)

67-C. Large Molybdenum Ingots by Arc Casting. Norman L. Deuble. *Metal Progress,* v. 67, Apr. 1955, p. 87-90.

Manufacture of high-purity molybdenum powder, its continuous formation into a consumable electrode, and its arc melting in a high vacuum into half-ton ingots of theoretical density. Photographs, diagram, table. (C5, Mo)

68-C. Electrolytic Cell for Titanium. B. W. Whitehurst. *Steel,* v. 136, Apr. 18, 1955, p. 107.

Plated on starting wire from low temperature molten salt in which rutile or ilmenite is dissolved. Diagram. (C23, Ti)

69-C. Practical Experiences With Continuous D. C. Casting of Light-Metal Alloys. K. E. Mann. *Henry Brutcher Translation No.* 3463, 21 p. (From *Aluminium,* v. 29, no. 12, 1953, p. 497-508.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 33-C, 1954.
(C5, Q general, Al, Mg)

70-C. Investigations Into the Aluminothermy of Manganese. K. Giesen and W. Dautzenberg. *Henry Brutcher Translation No.* 3464, 11 p. (Slightly condensed from *Archiv für Metallkunde,* v. 2, no. 2, 1948, p. 49-53.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 2C-26, 1949. (C26, Mn)

71-C. (Italian.) **The Use of Induction Furnaces for the Melting of Aluminum Alloys.** A. Tagliaferri and C. Barbazanges. *Alluminio,* v. 24, no. 1, Jan. 1955, p. 17-28.

Thermic efficiency of such furnaces. Diagrams, photographs, tables. (C21, Al)

72-C. Preliminary Investigation of Hafnium Metal by the Kroll Process. H. L. Gilbert and M. M. Barr. *Electrochemical Society, Journal,* v. 102, May 1955, p. 243-245.

Process from oxide to metal stages given with thermodynamic values for chlorination and reduction. Metal produced to date is hot malleable but not cold ductile. Photographs, table. 13 ref. (C26, Hf)

73-C. Electrolytic Reduction of Titanium Monoxide. M. E. Sibert, Q. H. McKenna, M. A. Steinberg and E. Wainer. *Electrochemical Society, Journal,* v. 102, May 1955, p. 252-262.

Electrolytic method for preparation of titanium metal from titanium monoxide. Photographs, tables, graphs, micrographs. 45 ref.
(C23, Ti)

74-C. Melt-Quality Tests for Light Alloys. J. Wood. *Foundry Trade Journal,* v. 98, Apr. 14, 1955, p. 397-400.

Test criteria are simple and easy to operate, give results quickly, must be accurate and inexpensive. Photographs, diagram. 3 ref. (C21)

75-C. Carbon Materials Required in Electrolytic Reduction of Alumina. S. W. Martin and H. W. Nelson. *Journal of Metals,* v. 7, Apr. 1955, p. 540-543.

Conversion of alumina to metallic aluminum by electrolytic reduction. Flowsheets, diagrams, table, photographs. 10 ref. (C23, Al)

76-C. Reclaiming Zirconium Chips for Arc-Melting Feed Stock. *Metallurgia,* v. 51, no. 306, Apr. 1955, p. 179-180.

Removal of cutting oils, adhered contaminants and oxygen contamination; preparation of melting stock; arc melting of ingots. Tables.
(C21, A8, Zr)

77-C. (Hungarian.) **Possibilities for Improving the Ampere Efficiency in Aluminum Electrolysis.** Pal Nagy. *Kohaszati Lapok,* v. 10, no. 3, Mar. 1955, p. 124-130.

Effects of increasing or stabilizing bath temperature, distance between the poles, composition of the bath, alumina concentration and of the increase in current density. Graphs. (C23, Al)

78-C. (Japanese.) **Studies on the Improvement of the Hydrometallurgy of Gold and Silver Ores.** Renpei Sei, Hideo Akutsu and Giichi Nishikido. *Resources Research Institute, Reports (Japan),* 1955, no. 19, Mar., 27 p.

Results of cyanidation test on the gold and silver ores from Oguchi mine, in Japan. Graphs, tables. 3 ref. (C24, Au, Ag)

79-C. Continuous Casting of Aluminum in a Grooved Mold. R. Irmann. *Henry Brutcher Translation No.* 2928, 4 p. (From *Giesserei, Technisch-Wissenschaftliche Beihefte,* 1952, nos. 6-8, p. 393-394.) Henry Brutcher, Altadena, Calif.

Occurrence of cold shuts and particulars on mechanism of formation; relationship between cold shuts and surface tension of molten metal. Photographs, diagrams.
(C5. P10. Al)

D

Ferrous Reduction and Refining

172-D. (Czech.) **High Gas Pressure Blast Furnaces.** Ludvik Broz. *Hutnické Listy,* v. 10, no. 2, Feb. 1955, p. 67-73.

Pressure losses; thermal efficiency; gas distribution; quality of pig iron produced. Design changes necessary for blast furnaces. Diagrams, table. 8 ref. (D1, Fe)

173-D. (French.) **Analysis of Performances of Blast Furnaces.** C. G. Thibaut. *Centre de Documentation Siderurgique, Circulaire d'Informations Techniques,* v. 12, no. 3, 1955, p. 563-582.

Various correlations between fuel consumption and other characteristics of blast furnace. Tables, graphs. 12 ref. (D1)

174-D. (French.) **Examination of Histograms on the Behavior of Converter Bottoms.** DeLong. *Centre de Documentation Siderurgique, Circulaire d'Informations Techniques,* v. 12, no. 3, 1955, p. 591-596.

Comparison of lining practice and experience at 16 French steel plants. Graphs, tables. (D3)

175-D. (French.) **Deoxidation of the Bath in a Basic Electric Arc Furnace.** S. Piérard and P. Flament. *Revue de métallurgie,* v. 52, no. 1, Jan. 1955, p. 5-26; disc., p. 26-27.

Methods of deoxidizing bath and slag of smelting furnaces to improve quality of steel. Diagram, graphs, tables, micrographs. 10 ref. (D5, ST)

176-D. (French.) **The Decarburization in the Basic Open-Hearth.** M. Urbain and P. Flament. *Revue de métallurgie,* v. 52, no. 3, Mar. 1955, p. 170-187; disc., p. 187-189.

Carbon-oxygen equilibrium; calculation of the partial pressures of carbon monoxide; nitrogen and hydrogen evolution. Graphs, tables. 14 ref. (D2, ST)

177-D. (French.) **Use of Gases in Metallurgy and the "Gazal" Process.** E. Spire. *Revue universelle des mines,* v. 11, ser. 9, no. 3, Mar. 1955, p. 111-120.

Use of gases in preparation of metals. Application of "Gazal" process, consisting of the injection of a gas into liquid metal through a porous refractory plug, in the desilication, denitration and desulfurization of cast iron, and desulfurization of steel. Diagrams, photographs, graphs, tables. 15 ref.
(D general, CI, ST)

178-D. (German.) **The Metallurgy of the Blast Furnace.** *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 179-181.

Effects of carbon, manganese, sulfur and silicon at various temperatures. Graphs. (D1)

179-D. Profitable Returns From Expansion of Blast Furnace Slag for Light Weight Aggregate. S. P. Kinney and Fred Osborne. *Blast Furnace and Steel Plant,* v. 43, May 1955, p. 493-501.

Combination of economy, strength, lightness of weight, insulating quali-

ties and appearance of the items produced makes this expanded slag an important factor in construction material field. Tables, photographs. 1 ref. (D1)

180-D. The Role of Sulphur in Iron and Steel Making. T. P. Colclough. *Blast Furnace and Steel Plant,* v. 43, May 1955, p. 502-507.

Control of distribution of sulphur is one of the most important factors in blast furnace operation. Tables. (D1, Fe, ST)

181-D. Ingots and Ingot Production. I. Ingot Structure and Blowhole Formation. G. Reginald Bashforth. *British Steelmaker,* v. 21, Apr. 1955, p. 116-119, 121.

Necessity of accurate control during final stages of refining prior to tapping. Ingot structure and mechanism of solidification and factors influencing blowhole formation. Diagrams, photographs. 27 ref. (D9, N12)

182-D. Separation of Soda Slag From Hot Metals. C. E. A. Shanahan. *Iron & Steel,* v. 28, Apr. 1955, p. 123-127.

Investigation of the rate at which soda slag separates, by flotation, into a surface layer after the metal addition; devising of methods suitable for efficiently separating surface slag phase from the metal. Diagram, tables, graph. 3 ref. (D1)

183-D. Refractories in the Iron and Steel Industry. III. Refractories in the Blast Furnace. Helen Towers. *Iron & Steel,* v. 28, Apr. 1955, p. 129-134.

Review of refractory materials for the stack, bosh and hearth and analysis of factors leading to destruction in each location. 55 ref. (D1)

184-D. Oxygen Steel Produced at Dofasco Can Compete With Open Hearth. F. J. McMulkin. *Journal of Metals,* v. 7, Apr. 1955, p. 530-534.

Describes new plant, practices, vessels and lining, temperature control, flux and slag control and final steel analysis. Diagrams, photographs, graphs. (D8)

185-D. Use of Open Hearth Slag in Blast Furnace Results in Recovery Economies. Edgar B. Speer. *Journal of Metals,* v. 7, Apr. 1955, p. 535-537.

Practices developed which permit usage, with no adverse effect on finished steel analyses or quality. Photograph, graphs, tables. (D1)

186-D. Anatomy of the Open Hearth. John S. Marsh. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Apr. 1955, p. 545-554.

Parts of furnaces, their behavior and functions. Tables, graphs, diagrams. 5 ref. (D2)

187-D. European Vacuum Melting History and Practice. H. H. Scholefield. *Metal Treatment and Drop Forging,* v. 22, Apr. 1955, p. 141-147.

Reviews past achievements and present trends. Diagrams. 10 ref. (D8, C25)

188-D. Sinter Makes Blast Furnace News. *Steel,* v. 136, May 9, 1955, p. 88, 90-91.

Advantages of a 100% sinter-ore charge in blast furnace operation. Photographs. (D1, Fe)

189-D. Experiments on the Melting of Pure Iron in High Vacuum. F. Wever, W. A. Fischer and H. Engelbrecht. *Henry Brutcher Translation No.* 3438, 19 p. (Slightly condensed from *Stahl und Eisen,* v. 74, no. 23, 1954, p. 1515-1521.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 22-D, 1955. (D8, Fe)

190-D. Smelting of Ore-Coal Briquets in the Low-Shaft Furnace. E. E. Hofmann. *Henry Brutcher Translation No.* 3470, 9 p. (Slightly abridged from *Stahl und Eisen,* v. 74, no. 23, 1954, p. 1464-1468.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 19-D, 1955. (D1, CI)

191-D. (English.) **On the Equilibrium Among Silicon in Molten Iron, Blast Furnace Slag and H_2-H_2O Mixed Gas. III. Investigation of the Equilibrium of the Reaction (SiO_2) $CaO-Al_2O_3$ (Sat.) + $2H_2$ = Si + $2H_2O$.** Koji Sanbongi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 605-613.

Experiments on the equilibrium of reducing reaction of SiO_2 in molten iron by H_2. Tables, graphs, diagram. 11 ref. (D1, Fe, Si)

192-D. (German.) **Drive and Control of Blast-Furnace Turbo-Blowers.** Werner Runte. *Stahl und Eisen,* v. 75, no. 8, Apr. 21, 1955, p. 461-474.

Prime movers and operation characteristics. Graphs, photographs, diagrams. (D1)

193-D. (German.) **Present State of Development of the Large Gas Engine as a Blowing Engine in Iron and Steelworks.** Hans Möhring. *Stahl und Eisen* v. 75, no. 8, Apr. 21, 1955, p. 474-478.

Present state of development of large gas engine and its ability to compete with other prime movers. Graphs. 8 ref. (D1)

194-D. (German.) **Magnet and Box-Type Charging Cranes of Modern Design for the Scrap Yard of an Open-Hearth Steel Plant.** Otto Berck and Karl Heinz Hüser. *Stahl und Eisen,* v. 75, no. 8, Apr. 21, 1955, p. 499-502.

Requirements to be met by scrap handling cranes. Design and operation of cranes. Photographs, diagrams, tables, graphs. 4 ref. (D2)

195-D. (Russian.) **Investigation of the Reduction of Iron Oxides by Graphite.** V. I. Arkharov, V. N. Bogoslovskii, M. G. Zhuravleva and G. I. Chufarov. *Zhurnal Fizicheskoi Khimii,* v. 29, no. 2, Feb. 1955, p. 272-279.

Vacuum reduction performed at various temperatures; dependence of Wüstite lattice parameter on degree of reduction. Graphs. 10 ref. (D8, Fe)

E

Foundry

181-E. Improving Investment Casting Quality. D. G. McCullough, F. J. Webbere and R. F. Thomson. *American Foundryman,* v. 27, Apr. 1955, p. 56-61.

Level of stress-rupture properties obtained for a nickel-chromium-iron alloy was raised and spread in results was decreased by gating investment cast test bars in accordance with practices determined by study of fluid flow characteristics in transparent plastic mold models. Photographs, graphs, diagrams. (E15, Ni)

182-E. Risering Ductile Cast Iron. R. A. Flinn, D. J. Reese and W. A. Spindler. *American Foundryman,* v. 27, Apr. 1955, p. 62-66.

How to calculate risering that will adequately prevent either centerline or riser-neck shrinkage. Tables, graph, radiographs, photographs. 2 ref. (E22, CI)

183-E. Defects in Steel Castings. R. A. Boustred. *Foundry Trade Journal,* v. 98, Mar. 24, 1955, p. 311-319.

Causes and remedies for blowholes, pinholes, shrinkage defects, scabs and other casting defects. Photographs, micrographs, table. (E25, CI)

184-E. (Norwegian.) **Gases in Cast Iron.** Edgar Bull Simonsen. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 15, no. 1, 1955, p. 6-12.

Effects of hydrogen, oxygen and nitrogen. Tables, graph. 22 ref. (E25, CI)

185-E. Process Engineering in the Foundry Industry. Jerome R. Young. *Foundry,* v. 83, May 1955, p. 104-105.

Emphasizes importance of process engineers in improving casting quality and increasing economy in foundry operations. Photographs, table. (E general)

186-E. Foundry Processes. *Foundry,* v. 83, May 1955, p. 106-127.

Trends and new developments in molding, melting, metals, heat treating and testing. Photographs. (E general)

187-E. Foundry Specializes in Centrifugal Casting. Edwin Bremer. *Foundry,* v. 83, May 1955, p. 130-135.

Products include wide range of hollow cylindrical tubes which vary in size from 3 to 54 in. in diam., up to 27 ft. in length, and from 25 to 60,000 lb. in weight. Both ferrous and nonferrous alloys are cast. Photographs, diagram. (E14)

188-E. Relationship Between Pouring Temperature, Porosity and Tensile Strength of Sand-Cast Bronze. W. T. Pell-Walpole. *Foundry Trade Journal,* v. 98, Mar. 31, 1955, p. 341-348.

Experimentation on effect of pouring temperature, using metal of controlled gas content, close control of casting variables and molds and mold coatings of selected composition with respect to their capacity for producing hydrogen. Graphs, table. 9 ref. (E25, E23, Cu)

189-E. Large, Intricate Shapes Made by Investment Casting. Irvin R. Kramer and Davidlee Von Ludwig. *Materials & Methods,* v. 41, Apr. 1955, p. 106-109.

Frozen mercury technique makes possible castings weighing 80 to 100 lb. and dimensions in excess of 36 in. Diagrams. (E15)

190-E. (Czech.) **Original and Secondary Defects of Casting.** Josef Pribyl. *Slévarenství,* v. 3, no. 3, Mar. 1955, p. 69-72.

Causes and analyses of casting defects. Diagrams. 6 ref. (E25)

191-E. (French.) **Green-Sand Molding of Copper Alloys.** Michel Goret and Pierre Delanoy. *Fonderie,* 1955, no. 109, Feb., p. 4385-4391.

Specifications for material and sands to be used. Diagrams, photograph. (E19, Cu)

192-E. (French.) **Some Developments in the Art of Casting Metals and Alloys.** L. W. Pateman and J. B. Rait. *Revue de métallurgie,* v. 52, no. 1, Jan. 1955, p. 33-46.

Developments in foundry practices, including investment casting, shell molding and centrifugal casting. Photographs, diagrams, micrographs. 34 ref. (E15, E16, E14)

193-E. (German.) **Surface Tension of Cerium Treated Cast Iron.** Rudolf Gautschi and Borut Marincek. *Giesserei,* v. 42, no. 6, Mar. 17, 1955, p. 121-123.

Relation between surface tension and formation of nodular graphite. Influence of cerium addition. Tables, micrograph, diagram. 10 ref. (E25, P10, CI)

194-E. (German.) **Study of Combustion in Cupola Furnace.** J. Navarro Alcacer and J. A. Andrés. *Giesserei,* v. 42, no. 6, Mar. 17, 1955, p. 124-127.

Method and installation used. Tables, graphs, diagrams. 4 ref. (E10)

195-E. (German.) **Investigation of Vertical Movements of the Metal When Flowing Into the Mold.** Tung-Ping Yao. *Giesserei,* v. 42, no. 7, Mar. 31, 1955, p. 145-153.

Theoretical analysis of flow, influence of gas pressure, "hydraulic shock effect" and "hydraulic jump effect", changes in properties of metals during flow. Graphs, diagrams. 7 ref. (E19)

196-E. (Russian.) **Mechanism of Nodular Graphite Formation.** A. A. Gorshkov. *Liteinoe Proizvodstvo,* 1955, no. 3, Mar., p. 17-20.

Analysis of the chemical reactions of metals with a low melting point —magnesium, magnesium alloys, or cerium and cast iron. Diagrams. 41 ref. (E25, Mg, Ce, CI)

197-E. (Russian.) **Cause of Gas Saturation of Silicon Brass.** V. M. Chursin and D. P. Lovtsov. *Liteinoe Proizvodstvo,* 1955, no. 3, Mar., p. 25-27.

Theoretical and experimental investigation of gas formation during smelting; influence of impurities in basic element; gas elimination methods. Drawings, tables, diagrams. 3 ref. (E10, Cu, Si)

198-E. (Swedish.) **Feeding and Solidification. V. Placing and Dimensioning of Feeders.** K. Akesson. *Gjuteriet,* v. 45, no. 3, Mar. 1955, p. 31-38.

Position, in relation to heat center of casting, and method of determining size of feeders. Diagrams, table, graph. 4 ref. (E23, E25)

199-E. Investment Casting. I-III. *American Machinist,* v. 99, Apr. 25, 1955, p. 155, 157, 159.

Methods of controlling pattern shrinkage; larger casting problems; mold cracking. Diagrams. (E15)

200-E. Metallurgical Blast Cupola Offers Improved Melting Efficiency. S. T. Jaswinski. *Iron Age,* v. 175, Apr. 21, 1955, p. 87-91.

Combines operating characteristics of blast furnace with low pressure blast and continuous tapping features of conventional cupola. Photographs, micrographs, tables. (E10)

201-E. Precision Alloy Steel Castings. *Iron & Steel,* v. 28, Apr. 1955, p. 135-137.

Advantages of process, structural and mechanical properties, design and examples of application. Photographs, table, micrograph. (E15)

202-E. Guide to Ejector Pin Mounting. W. M. Halliday. *Precision Metal Molding,* v. 13, May 1955, p. 45-50.

Effect of ejector design on flash, distortion and inaccuracy, speed of casting and life and maintenance of die. Diagrams. (E13)

203-E. Eliminate Leakage of Airborne Castings. Lowell Palmer. *Precision Metal Molding,* v. 13, May 1955, p. 55-58.

Castings are impregnated by three different methods. Table, photographs. (E25)

204-E. Production of Foundry Cores by the Carbon Dioxide Process and Equipment Needed. W. Saubermann. *Henry Brutcher Translation No.* 3409, 19 p. (Slightly abridged from *Giesserei-Praxis,* v. 73, no. 2, 1955, p. 29-32; no. 3, 1955, p. 49-51.) Henry Brutcher, Altadena, Calif.

Principles of and results obtained with a carbon dioxide "baking" process, which emphasizes lower costs. Diagrams. (E21)

205-E. (French.) **Influence of Copper on Cast Irons Containing Magnesium.** R. M. Lamb. *Fonderie,* 1955, no. 110, Mar., p. 4403-4412.

Possibilities of using copper with magnesium in the production of nodular cast iron. Tables, graphs, micrographs. (E25, Cu, Mg, CI)

206-E. (French.) **Functioning of an Average-Size Water-Cooled Cupola.** Pierre Hubert. *Fonderie,* 1955, no. 110, Mar., p. 4414-4422.

Operating characteristics and advantages and disadvantages of cupola installed in a cast-iron foundry. Diagrams, tables, graphs, photograph. (E10, CI)

207-E. (German.) **Further Development of Exothermic Riser Inserts in Steel Casting.** Friedrich Dubielzig and Heinz Kühne. *Giessereitechnik,* v. 1, no. 2, Feb. 1955, p. 13-15.

Changes in composition of the thermic mass; new casting technique. Photographs, table, graphs. 1 ref. (E22, ST)

208-E. (German.) **NE-Heavy Metal Centrifugal Casting. Development and Requirements for Centrifugal Casting Method.** R. R. Domanowski. *Metall,* v. 9, nos. 7-8, Apr. 1955, p. 291-297.

Process characteristics, mechanical potentials, selection of mold material, technical objectives, advantages and its recognition in German industrial standards. Tables. (E14)

209-E. (Hungarian.) **Correct Design of Machine Elements From the Point of View of Foundry Technology, With Special Regard to Steel Castings.** Géza Jandy. *Ontöde,* v. 6, no. 3, Mar. 1955, p. 47-54.

Factors to be considered in designing are composition, wall thickness, tensile strength, bend resistance, hardness and shrinkage of the casting; weldability and forgeability of steel castings. Tables, graphs, diagrams. (E general, CI)

210-E. (Hungarian.) **Application of Easily Removable Risers on Non-Ferrous Metals Castings.** Marton Solti, Pal Németh and Gyula Emöd. *Ontöde,* v. 6, no. 3, Mar. 1955, p. 59-63.

Composition and treatment of the separating plates; dimensions of risers that can be broken off. Diagrams, photographs. 3 ref. (E22, EG)

211-E. (Hungarian.) **Calculating the Gating Systems Applied in Iron Foundries.** Sandor Vékony. *Ontöde,* v. 6, no. 3, Mar. 1955, p. 63-65.

Problems of temperature, height of casting, dimension of horizontal canal. Diagrams, graphs, tables. (E22, CI)

212-E. (Pamphlet.) **Investment Precision Casting.** Report no. PB 111001-R. 27 p. 1954. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.75.

Summarizes latest developments in the preparation of dies and patterns, molding methods, compositions used, investment, and heating and melting methods. 192 ref. (E15)

213-E. (Book.) **Bibliography on Casting Defects.** 9 p. 1955. American Foundryman's Society, Des Plaines, Illinois.

A selected bibliography dealing with the most important literature references on casting defects. (E25)

F

Primary Mechanical Working

86-F. Considerations for Selecting Steel Extrusions. S. O. Evans. *Metal Progress,* v. 67, Apr. 1955, p. 91-95.

Ugine-Séjournet extrusion process involving use of molten glass as a lubricant. Diagrams. (F24, ST)

87-F. The Rolling of Metals and Alloys. IV. Resistance to Deformation and Other Factors Which Determine the Magnitude of the Rolling Load. E. C. Larke. *Sheet Metal Industries,* v. 32, no. 336, Apr. 1955, p. 299-304, 306.

Influence of roll diameter, resistance to deformation, influence of rate of deformation, temperature of rolling and effect of coiler and decoiler tension. Diagram, graphs, tables. 5 ref. (To be continued.) (F23)

88-F. (French.) **New Constructions in Rolling Mills.** Neumann. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 12, no. 3, 1955, p. 609-632.

Safety apparatus for rolling mills and auxiliary equipment. Diagrams. (F23, A7)

89-F. (French.) **Comparative Examination of Different Systems of Hot Deformation.** Giovanni Dallapicola. *Métallurgie et la construction mécanique,* v. 87, no. 3, Mar. 1955, p. 197, 199, 201.

Rolling, circular hammering, upsetting of pieces reheated by electrical resistance and forging and stamping of pieces reheated by high-frequency induced currents. Micrographs, diagram. (F22, F23, G3)

90-F. (French.) **Forged and Stamped Aluminum Alloy Pieces. I.** Robert Colomb. *Revue de l'aluminium,* v. 32, no. 218, Feb. 1955, p. 167-176.

Obtaining one-piece parts that are strong, light, impervious to gases and liquids, easy to machine and highly resistant to corrosion. (To be continued.) (F22, G3, Al)

91-F. (German.) **Power Requirement and Forming in Extrusion and Die-Forging.** A. Geleji. *Acta Technica Academiae Scientiarum Hungaricae,* v. 10, nos. 1-2, 1955, p. 187-220.

Verification of theory of extrusion, formerly established by the author; calculation of forces developed in die forging. Diagrams, graphs, photographs. 14 ref. (F22, F24)

92-F. (German.) **Determination of Characteristics of Static and Dynamic Load in Single-Stand Rough Plate Rolling Mill by Calculation and Experiments.** Karl-Heinz Lucas and Otto Emicke. *Metallurgie und Giessereitechnik,* v. 5, no. 1, Jan, 1955, p. 7-18.

Theoretical analysis resulting in formulas corroborated by experimental investigation. Diagrams, tables, photographs. 13 ref. (F23)

93-F. (German.) **Problem of Static and Dynamic Loads in Rough Plate, Two-High, Reversible Rolling Mills and in Their Drives as a Basis for Their Effective Design and for Determination of Their Efficient Inspection Method.** Otto Emicke. *Metallurgie und Giessereitechnik,* v. 5, no. 1, Jan. 1955, p. 19-34.

Structural analysis. Relation between construction details and wear and tear. Diagrams, graphs, tables, photographs. 26 ref. (F23)

94-F. (German.) **Problem of the Formation of Surface Defects on Aluminum Sheets.** Roland Funk. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 180-182.

Relation between nonhomogeneity of the sheet surface and condition of rolling. Diagrams, photographs. 8 ref. (F23, Al)

95-F. (Russian.) **Stress Distribution in Metal During Forging of Shafts and Bars.** E. P. Unksov and V. M. Zavartseva. *Vestnik Mashinostroeniia,* v. 35, no. 3, Mar. 1955, p. 42-48.

Photo-elastic studies, technique of plotting diagrams. Photographs, diagrams, tables. 3 ref. (F22, Q25)

96-F. (Russian.) **Formation of Internal Flaws During Transversel Forging.** V. S. Smirnov. *Vestnik Mashinostroeniia,* v. 35, no. 3, Mar. 1955, p. 49-53.

Causes and methods of prevention. Graphs, table, diagrams, photographs. 3 ref. (F22)

97-F. Substitutes for Palm Oil in the Cold Rolling of Steel. W. R. Johnson, J. P. Sheehan, and Harry Schwartzbart. *Blast Furnace and Steel Plant,* v. 43, Apr. 1955, p. 415-423.

Development of a substitute lubricant for use in cold rolling of steel. Tables, graphs. 2 ref. (F23, F1, ST)

98-F. Precision Finishing Techniques for Magnetic Alloys. A. I. Nussbaum. *Electrical Manufacturing,* v. 55, May 1955, p. 106-111.

Final rolling, slitting and leveling of high permeability sheet. Diagrams, photographs, graphs, table. (F29, SG-n)

99-F. Wrought Carbon and Alloy Steel: Forging Characteristics. *Machine Design,* v. 27, May 1955, p. 172-175.

Production characteristics of various steels; guides for selection of forging metal. Tables, photographs. (F22, CN, AY)

100-F. Wrought Carbon and Alloy Steel: Hot Extrudability. Clark Church. *Machine Design,* v. 27, May, 1955, p. 179-182.

Advantages of extruded shapes; characteristics of extrudable ferrous and nonferrous alloys. Photographs, table. (F24, ST, SS, Ni, Ti)

101-F. Extrusions Put Squeeze on Costs. Robert M. Love. *Steel,* v. 136, May 9, 1955, p. 78-81.

Substituting extruded pieces for rotor wedges, instead of machining, results in low cost, fast delivery, superior physical properties and shapes dimensionally close to the cross section of the finished product. Photographs, diagrams. (F24, AY, SS, Al, CN)

102-F. Which Frequency Do You Choose? *Steel,* v. 136, May 2, 1955, p. 126-128, 130.

Advantages of preheating by induction with low, high or dual frequency. Photographs, diagram, tables. (F21, CN)

103-F. Hot Extrusion at J & L—Solid Carbon Steel Sections Now in Production. *Steel Processing,* v. 41, Apr. 1955, p. 230-233, 256.

Plant will produce extrusions in solid sections which will range in weight from ⅓ lb. to 12 lb. per lineal ft., and up to 24 ft. in length. Photographs. (F24, CN)

104-F. High-Speed Generator Forgings. C. M. Laffoon. *Westinghouse Engineer,* v. 15, May 1955, p. 94-98.

Development and introduction of new and specialized inspection techniques and forging art improvements have made possible the production of large, high-quality rotor forgings for turbine generators. Photographs, diagram. (F22)

105-F. An Investigation of the Mechanics of Wire-Drawing. J. G. Wistreich. *Wire Industry,* v. 22, Apr. 1955, p. 421 + 6 pages.

Relation between external forces, boundary conditions of the process and plastic properties of the wire. Graphs, diagrams, tables, photograph. (F28)

106-F. (German.) **Investigations on Cold and Hot Rolling With Drag Roll and Determination of Roll Slippage by Means of the Forward Slip.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 75, no. 7, Apr. 7, 1955, p. 391-401.

Development and application of the drag roll drive, test results, roll slippage and comparison of test results; equation to compute slippage. Micrographs, table, diagram, graphs, photographs. 21 ref. (F23, ST)

107-F. (German.) **The Use of the Magnetic Amplifier for the Quick Control of Rolling Mill Drives.** Joachim Wetzger. *Stahl und Eisen,* v. 75, no. 8, Apr. 21, 1955, p. 478-485.

Revolution and speed control of electric drives. Equipment and operating characteristics. Graphs, diagrams, photographs. (F23)

G Secondary Mechanical Working

91-G. Metal Machining. II. Cutting Forces and Cutting Conditions. III. Angles of Cutting Tools. W. Alfred Carter. *Machinery Lloyd (Overseas Ed.),* v. 27, Mar. 19, 1955, p. 37, 39, 41-43; Mar. 26, 1955 p. 69, 71-73.

Effect of chip heat and cutting fluid on tool life. Diagrams, photographs. (G17)

92-G. A Study of Electro-Erosion Processes. Sparks and Arcs. H. Axer. *Machinist (London),* v. 99, Mar. 25, 1955, p. 529-534.

Differences of principle and result of electro-erosion methods. Circuit diagrams, oscillograms, photographs, tables. (G17)

93-G. Electric Spark Machining. Everard M. Williams and C. Paul Porterfield. *Consulting Engineer,* v. 5, Apr. 1955, p. 34-37.

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94-G. The Production of Perforated Metal Sheet. *Machinery (London),* v. 86, Apr. 15, 1955, p. 792-803.

Materials used, production methods, machines and applications. Diagrams, photographs. (G3)

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Effect of tool angle and heat treating on machinability. (G17, SS)

96-G. Electronic Control of Machine Tools. *Mechanical World and Engineering Record,* v. 135, Apr. 1955, p. 158-161.

Several forms of tracer control equipment which are applicable to a wide range of machine tools. Diagrams, photographs. (G17)

97-G. Phosphate Coating Retention During Cold Extrusion of Artillery Shells. Lloyd O. Gilbert, Stanley L. Eisler, Jodie Doss and W. Dennis McHenry. *Metal Finishing,* v. 53, Apr. 1955, p. 56-58, 61.

Use of coating containing radiophosphorus. Approximately 89% of the coating remained after extrusion. Photographs, tables. 8 ref. (G5, G21, CN)

98-G. Factors Influencing the Drilling of Titanium. *Metal-Working,* v. 11, May 1955, p. 20-21.

Type of drill to use, feed and point angles and general rules for drilling. Graphs, table, photographs. (G17, Ti)

99-G. Factors Affecting Machinability and Tool Wear in Working Copper and Its Alloys. *Metal-Working,* v. 11, May 1955, p. 22-25.

Cutting speed, surface finish and accuracy of machined work. Tables. (G17, Cu)

100-G. Surface Finish, Dimensional Accuracy and Alteration in Structure of Workpieces Machined by Electric Methods. H. Opitz. *Microtecnic (English Ed.),* v. 9, no. 1, 1955, p. 14-20.

Methods found for machining even the hardest materials such as stellite, hard metals and magnetic alloys. Diagrams, micrographs, graphs. 4 ref. (G17)

101-G. Precision Contour Rolling of Metals. A. E. Felt. *Tooling and Production,* v. 21, Apr. 1955, p. 55-58.

Contour rolling is closely integrated with precision forging and forming, flash welding and fusion welding—to economically produce lighter and stronger structures. Diagrams, photographs. (G11)

102-G. (French.) **Method of Measuring the Effectiveness of Cutting Lubricants.** P. Eugene. *Revue universelle des mines,* v. 11, ser. 9, no. 3, Mar. 1955, p. 101-110.

Determination and calculation of behavior of cutting fluids under various machining conditions. Diagrams, tables, photographs, graphs. 4 ref. (G21)

103-G. Machining Aluminium. *Aluminium Development Association, Information Bulletin No.* 7, Dec. 1954, 56 p.

Workshop practices used in machining aluminum and aluminum alloys. Tables, photographs, diagrams. (G17, Al)

104-G. Cope Talks on Draw Dies. XXVII. Stainless and Nickel Alloys Require Stronger Draw Dies. Stanley R. Cope. *American Machinist,* v. 99, Apr. 25, 1955, p. 122-124.

Requirements in design of draw dies used for blanking, forming and drawing and diameter reductions. Tables. (To be continued.) (G4, SG, Ni)

105-G. How to Select Wheels for Grinding Tool Steel. Clifton C. Nickerson. *American Machinist,* v. 99, May 9, 1955, p. 121-125.

Classification of SAE toolsteels by their grinding characteristics is the basis for selecting the right grinding wheel. Tables. (G18, TS)

106-G. Cold Power Spinning Saves Material, Cuts Costs. Kenneth W. Stalker and Kenneth W. Moore. *American Machinist,* v. 99, May 9, 1955, p. 126-131.

Advantages, equipment, lubricants and procedures for hydrospinning. Diagrams, photographs, micrographs. (G13)

107-G. American Machinist Reference Book Sheet. Press Tools for Bending. Don R. King. *American Machinist,* v. 99, May 9, 1955, p. 171, 173, 175.

Schematic drawings of press tools serve as reference guide for intelligent selection of the proper tools. Diagrams. (G6)

108-G. Cutter Design and Application for Face-Milling Cast Iron and Steel. O. W. Boston and W. W. Gilbert. *American Society of Mechanical Engineers, Paper No.* 54—A-51, 1955, 16 p.

Power and cutter life are averaged for various grades of cast iron, tool materials, feed, depth, width of bar, number of teeth in the cutter and cutting speed. Table, graphs, diagrams. (G17, CI, ST)

109-G. The Friction Process in Metal Cutting. Iain Finnie and M. C. Shaw. *American Society of Mechanical Engineers, Paper No.* 54—A-108, 1955, 12 p.

It is shown that a coefficient of friction is inadequate to characterize the friction process in cutting, being mainly an indication of the normal stress on the tool face, and thus strongly dependent on the shear process in cutting. Table, graphs, photographs. 18 ref. (G17, Q9)

110-G. Temperature Distribution at the Tool-Chip Interface in Metal Cutting. B. T. Chao and K. J. Trigger. *American Society of Mechanical Engineers, Paper No.* 54—A-115, 1955, 26 p.

Rapid, iterative method for computing temperatures. Calculation shows that maximum temperature

occurs at a point near the trailing edge of the contact when chips are produced at conventional feeds and speeds with sintered-carbide tools. Graphs, diagrams, photograph, tables. 27 ref. (G17)

11-G. The Effect of Wheel-Work Conformity in Precision Grinding. Robert S. Hahn. *American Society of Mechanical Engineers, Paper No.* 54—A-178, 1955, 10 p.

Experimental results show that the rate of metal removal varies as the 0.18 power of the curvature difference. Two modes of grinding action are recognized, one in which stock removal is proportional to work speed and independent of wheel speed and the other where the reverse is true. Graphs, diagrams. (G18)

112-G. The Mechanics of the Simple Shearing Process During Orthogonal Machining. Bernard W. Shaffer. *ASME, Transactions,* v. 77, Apr. 1955, p. 331-336.

Chip formation analyzed; analytical expressions developed for the force required to machine a given material with a tool having a prescribed coefficient of friction. Diagrams, graphs. 14 ref. (G17)

113-G Measurement of Cutting Forces. *Automobile Engineer,* v. 45, Apr. 1955, p. 167-171.

Study of cutting phenomena, by measuring the forces involved, based on influences of cutting speeds, coolant, heat treatment and tool material. Photographs, diagrams, graphs. (G17)

114-G. Cold Extrusion Marches On. I. James M. Leake. *Finish,* v. 12, May 1955, p. 27-28, 74.

History of cold forming; technical description of various phases of the process. Photographs. (G5, ST)

115-G. Deep Drawing Aluminum Alloys. James K. Wareham. *Machine and Tool Blue Book,* v. 50, May 1955, p. 155-167.

Alloy selection, equipment, tool design, tool finish and lubricants. Photographs, tables, diagrams. (G4, Al)

116-G. Wrought Carbon and Alloy Steel: Drawing Properties. Carter C. Higgins. *Machine Design,* v. 27, May 1955, p. 158-161.

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118-G. Wrought Carbon and Alloy Steel: Cold Heading Properties. David H. Samuelson. *Machine Design,* v. 27, May 1955, p. 176-178.

Production procedures, headability ratings for various steels. Tables, photographs, diagrams, graph. (G10, CN, AY)

119-G. Brass, Bronze and Copper. Arthur I. Heim. *Machine Design,* v. 27, May 1955, p. 205-212.

Stamping, drawing, shearing, forming, bending, cold and hot forging, heading, upsetting, machinability. Tables, photographs. (G general, F22, Cu)

120-G. 18 Tips on Practical Stamping Design. Federico Strasser, *Machine Design,* v. 27, May 1955, p. 232-235.

Suggestions for lowering stamping costs. Diagrams. (G3)

121-G. Milling With Carbide Can Be Profitable. Douglas C. Cunningham. *Machinery,* v. 61, May 1955, p. 161-167.

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What it is and can do, where to use it, how to design and make cutters, ideas in toolholders. Diagrams, photographs. (G17)

123-G. Chip Control Steps-Up Gear-Shaper Output. J. F. Jones. *Machinist (London),* v. 99, May 1955, p. 632-637.

Slight change in rake angle gives essential chip-flow control. Photographs, diagrams, graphs. (G17)

124-G. Hydrospinning Aircraft Components. J. A. Logan. *Modern Machine Shop,* v. 27, May 1955, p. 122-123.

Machine tool squeezes cold alloy steels into desired shapes, reducing production time and costs. Photographs. (G13, AY)

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With a change in tooling, the thread roller can form close tolerance threads and can roll worms, splines and even gears. Photographs, diagrams. (G12)

127-G. Precision Radial Draw Forming. Joseph Fredericks. *Tooling and Production,* v. 21, May 1955, p. 83-87.

Equipment and procedures for production of jet engine parts. (G4)

128-G. Inert-Gas Metal-Arc Cutting. R. S. Babcock. *Welding Journal,* v. 34, Apr. 1955, p. 309-315.

Consumable electrode cutting process for straight-line, circular and shape cuts on nonferrous metals. Diagrams, graphs, photographs, micrographs, table. (G22)

129-G. Electrochemical and Electromechanical Machining of Metals at Low Voltages. V. K. Nevezhin. *Henry Brutcher Translation No.* 2911, 18 p. (From *Elektrichestvo,* 1951, no. 11, p. 62-70.) Henry Brutcher, Altadena, Calif.

Process is based on erosion of material of the electrodes under the action of a nonstationary electric discharge. Graphs, diagram, circuit diagram, tables, oscillograms. 2 ref. (G17)

130-G. Ultrasonic Machining of Holes in Hard Materials. M. M. Pisarevskii. *Henry Brutcher Translation No.* 3484, 7 p. (From *Stanki i Instrument,* v. 25, no. 5, 1954, p. 16-20.) Henry Brutcher, Altadena, Calif.

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H
Powder Metallurgy

109-H. Metal-Ceramic Interactions. V. Note on Reactions of Metals With Titanium Carbide and Titanium Nitride. W. D. Kingery and F. A. Halden. *American Ceramic Society Bulletin,* v. 34, Apr. 1955, p. 117-119.

Interfaces and powder mixtures studied microscopically and with X-ray techniques. Diagram, tables. 11 ref. (H12, M26, Mo, Nb, Ni, Fe, Si, Ti, Zn)

110-H. Porosity and Permeability Changes During the Sintering of Copper Powder. G. Arthur. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 329-336.

Measurements on copper powders sintered in hydrogen for periods up to 100 hr. at 1000° C. Diagrams, graphs, tables. 14 ref. (H15, Cu)

111-H. Progress Report on Cermets. Frank W. Glaser. *Metal Progress,* v. 67, Apr. 1955, p. 77-82, 138.

Properties and applications of nickel aluminides, titanium carbide with metal binder and borides of chromium-molybdenum. Micrograph, tables, graphs, photographs. (H general)

112-H. Production of Copper Strip. H. Franszen. *Metal Industry,* v. 86, Mar. 25, 1955, p. 227-229. (From *Zeitschrift für Metallkunde,* v. 45, no. 6, June 1954, p. 328-331.)

Previously abstracted from original. See item 122-H, 1954. (H general, Cu)

113-H. New Trends in Powder Metallurgy. Herbert B. Michaelson. *Materials & Methods,* v. 41, Apr. 1955, p. 92-97.

Developments in the use of metal powders for rolled sheet, special structures and flame spraying. Photographs, tables. 11 ref. (H general)

114-H. Porous Metal Sheet. John B. Campbell. *Materials & Methods,* v. 41, Apr. 1955, p. 98-101.

Controlled permeability plus resistance to heat and corrosion make metal powder sheet materials useful for special applications. Photographs, diagrams, table, micrograph, graphs. (H general)

115-H. (Czech.) **Sintered Frictional Materials.** W. Cegielski. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 17-23.

Survey of powdered frictional materials, technology of their production, application and various types of design solutions. Tables, diagrams, micrographs, photograph. 7 ref. (H general)

116-H. (German.) **Influence of Alloy Conditions on the Physical Properties and Recrystallization of Vacuum Sintered Molybdenum.** Egon Pipitz and Richard Kieffer. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 187-194.

Investigation of the influence of beryllium, titanium, zirconium, vanadium, thorium, columbium, tantalum, chromium, tungsten and manganese on the recrystallization process and physical properties. Tables, graphs, photographs. 15 ref. (H general, N5, P general, Mo)

117-H. (Italian.) **Sintering of Brass.** Neri Corsini. *Metallurgia italiana,* v. 47, no. 2, Feb. 1955; *Atti notizie* (AIM), v. 10, no. 2, Feb. 1955, p. 49-52; disc., p. 52.

Technical characteristics of sintered brass powders; economic aspects. Table, graphs, micrographs. 8 ref. (H15, Cu)

118-H. (Russian.) **Investigation of Local Temperature at Cathode During Electrolytic Deposition of Metallic Powders.** D. N. Gritsan and A. M. Bulgakova. *Doklady Akademii Nauk SSSR,* v. 100, no. 6, Feb. 21, 1955, p. 1111-1114.

Relation of maximum value of temperature differences to current densities of different cadmium sulfate concentrations. Graphs, table. 5 ref. (H10, Cd)

119-H. SAP Retains Properties After High Temperature Exposure. Roland Irmann. *Iron Age,* v. 175, Apr. 28, 1955, p. 104-106.

Ability of sintered aluminum powder to retain high mechanical

97-F. Substitutes for Palm Oil in the Cold Rolling of Steel. W. R. Johnson, J. P. Sheehan, and Harry Schwartzbart. *Blast Furnace and Steel Plant,* v. 43, Apr. 1955, p. 415-423.

Development of a substitute lubricant for use in cold rolling of steel. Tables, graphs. 2 ref. (F23, F1, ST)

98-F. Precision Finishing Techniques for Magnetic Alloys. A. I. Nussbaum. *Electrical Manufacturing,* v. 55, May 1955, p. 106-111.

Final rolling, slitting and leveling of high permeability sheet. Diagrams, photographs, graphs, table. (F29, SG-n)

99-F. Wrought Carbon and Alloy Steel: Forging Characteristics. *Machine Design,* v. 27, May 1955, p. 172-175.

Production characteristics of various steels; guides for selection of forging metal. Tables, photographs. (F22, CN, AY)

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Advantages of extruded shapes; characteristics of extrudable ferrous and nonferrous alloys. Photographs, table. (F24, ST, SS, Ni, Ti)

101-F. Extrusions Put Squeeze on Costs. Robert M. Love. *Steel,* v. 136, May 9, 1955, p. 78-81.

Substituting extruded pieces for rotor wedges, instead of machining, results in low cost, fast delivery, superior physical properties and shapes dimensionally close to the cross section of the finished product. Photographs, diagrams. (F24, AY, SS, Al, CN)

102-F. Which Frequency Do You Choose? *Steel,* v. 136, May 2, 1955, p. 126-128, 130.

Advantages of preheating by induction with low, high or dual frequency. Photographs, diagram, tables. (F21, CN)

103-F. Hot Extrusion at J & L—Solid Carbon Steel Sections Now in Production. *Steel Processing,* v. 41, Apr. 1955, p. 230-233, 256.

Plant will produce extrusions in solid sections which will range in weight from ⅓ lb. to 12 lb. per lineal ft., and up to 24 ft. in length. Photographs. (F24, CN)

104-F. High-Speed Generator Forgings. C. M. Laffoon. *Westinghouse Engineer,* v. 15, May 1955, p. 94-98.

Development and introduction of new and specialized inspection techniques and forging art improvements have made possible the production of large, high-quality rotor forgings for turbine generators. Photographs, diagram. (F22)

105-F. An Investigation of the Mechanics of Wire-Drawing. J. G. Wistreich. *Wire Industry,* v. 22, Apr. 1955, p. 421 + 6 pages.

Relation between external forces, boundary conditions of the process and plastic properties of the wire. Graphs, diagrams, tables, photograph. (F28)

106-F. (German.) **Investigations on Cold and Hot Rolling With Drag Roll and Determination of Roll Slippage by Means of the Forward Slip.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 75, no. 7, Apr. 7, 1955, p. 391-401.

Development and application of the drag roll drive, test results, roll slippage and comparison of test results; equation to compute slippage. Micrographs, table, diagram, graphs, photographs. 21 ref. (F23, ST)

107-F. (German.) **The Use of the Magnetic Amplifier for the Quick Control of Rolling Mill Drives.** Joachim Wetzger. *Stahl und Eisen,* v. 75, no. 8, Apr. 21, 1955, p. 478-485.

Revolution and speed control of electric drives. Equipment and operating characteristics. Graphs, diagrams, photographs. (F23)

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Equipment and procedures for production of jet engine parts. (G4)

128-G. Inert-Gas Metal-Arc Cutting. R. S. Babcock. *Welding Journal,* v. 34, Apr. 1955, p. 309-315.
Consumable electrode cutting process for straight-line, circular and shape cuts on nonferrous metals. Diagrams, graphs, photographs, micrographs, table. (G22)

129-G. Electrochemical and Electromechanical Machining of Metals at Low Voltages. V. K. Nevezhin. *Henry Brutcher Translation No.* 2911, 18 p. (From *Elektrichestvo,* 1951, no. 11, p. 62-70.) Henry Brutcher, Altadena, Calif.
Process is based on erosion of material of the electrodes under the action of a nonstationary electric discharge. Graphs, diagram, circuit diagram, tables, oscillograms. 2 ref. (G17)

130-G. Ultrasonic Machining of Holes in Hard Materials. M. M. Pisarevskii. *Henry Brutcher Translation No.* 3484, 7 p. (From *Stanki i Instrument,* v. 25, no. 5, 1954, p. 16-20.) Henry Brutcher, Altadena, Calif.
Previously abstracted from original. See item **438-G, 1954.** (G17)

H
Powder Metallurgy

109-H. Metal-Ceramic Interactions. V. Note on Reactions of Metals With Titanium Carbide and Titanium Nitride. W. D. Kingery and F. A. Halden. *American Ceramic Society Bulletin,* v. 34, Apr. 1955, p. 117-119.
Interfaces and powder mixtures studied microscopically and with X-ray techniques. Diagram, tables. 11 ref. (H12, M26, Mo, Nb, Ni, Fe, Si, Ti, Zn)

110-H. Porosity and Permeability Changes During the Sintering of Copper Powder. G. Arthur. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 329-336.
Measurements on copper powders sintered in hydrogen for periods up to 100 hr. at 1000° C. Diagrams, graphs, tables. 14 ref. (H15, Cu)

111-H. Progress Report on Cermets. Frank W. Glaser. *Metal Progress,* v. 67, Apr. 1955, p. 77-82, 138.
Properties and applications of nickel aluminides, titanium carbide with metal binder and borides of chromium-molybdenum. Micrograph, tables, graphs, photographs. (H general)

112-H. Production of Copper Strip. H. Franszen. *Metal Industry,* v. 86, Mar. 25, 1955, p. 227-229. (From *Zeitschrift für Metallkunde,* v. 45, no. 6, June 1954, p. 328-331.)
Previously abstracted from original. See item 122-H, 1954. (H general, Cu)

113-H. New Trends in Powder Metallurgy. Herbert B. Michaelson. *Materials & Methods,* v. 41, Apr. 1955, p. 92-97.
Developments in the use of metal powders for rolled sheet, special structures and flame spraying. Photographs, tables. 11 ref. (H general)

114-H. Porous Metal Sheet. John B. Campbell. *Materials & Methods,* v. 41, Apr. 1955, p. 98-101.
Controlled permeability plus resistance to heat and corrosion make metal powder sheet materials useful for special applications. Photographs, diagrams, table, micrograph, graphs. (H general)

115-H. (Czech.) **Sintered Frictional Materials.** W. Cegielski. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 17-23.
Survey of powdered frictional materials, technology of their production, application and various types of design solutions. Tables, diagrams, micrographs, photograph. 7 ref. (H general)

116-H. (German.) **Influence of Alloy Conditions on the Physical Properties and Recrystallization of Vacuum Sintered Molybdenum.** Egon Pipitz and Richard Kieffer. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 187-194.
Investigation of the influence of beryllium, titanium, zirconium, vanadium, thorium, columbium, tantalum, chromium, tungsten and manganese on the recrystallization process and physical properties. Tables, graphs, photographs. 15 ref. (H general, N5, P general, Mo)

117-H. (Italian.) **Sintering of Brass.** Neri Corsini. *Metallurgia italiana,* v. 47, no. 2, Feb. 1955; *Atti notizie* (AIM), v. 10, no. 2, Feb. 1955, p. 49-52; disc., p. 52.
Technical characteristics of sintered brass powders; economic aspects. Table, graphs, micrographs. 8 ref. (H15, Cu)

118-H. (Russian.) **Investigation of Local Temperature at Cathode During Electrolytic Deposition of Metallic Powders.** D. N. Gritsan and A. M. Bulgakova. *Doklady Akademii Nauk SSSR,* v. 100, no. 6, Feb. 21, 1955, p. 1111-1114.
Relation of maximum value of temperature differences to current densities of different cadmium sulfate concentrations. Graphs, table. 5 ref. (H10, Cd)

119-H. SAP Retains Properties After High Temperature Exposure. Roland Irmann. *Iron Age,* v. 175, Apr. 28, 1955, p. 104-106.
Ability of sintered aluminum powder to retain high mechanical

properties after continued exposure to high temperature suggests many interesting applications. Graphs, tables. (H11, Al)

120-H. Rolling 18-8 Stainless Steel Powder Into Strip. Samuel Storchheim, John Nylin and Bernard Sprissler. *Sylvania Technologist,* v. 8, Apr. 1955, p. 42-44.

Results of investigation indicate possibility of producing strips possessing high density, high tensile strength, good ductility and corrosion resistance, and relatively random crystallographic orientation. Tables, graphs. 7 ref. (H14, SS)

121-H. Sintering of Powders and Related Processes. A. S. Berezhnoi. *Henry Brutcher Translation No.* 2889, 25 p. (From *Ogneupory,* v. 13, no. 6, 1948, p. 256-266.) Henry Brutcher, Altadena, Calif.

Classification of sintering processes; causes of growth of grains during sintering; types of distortions found in crystal lattice; five successive stages of "dry" sintering. Graphs. 22 ref. (H15)

122-H. Study of the Production of (Secondary) Cobalt and Tungsten-Carbide Powders. H. Rutkowski, B. Razumowski and I. Glinska. *Henry Brutcher Translation No.* 3487, 13 p. (From *Prace Glownego Instytutu Metalurgii,* v. 4, no. 4, 1952, p. 153-160.) Henry Brutcher, Altadena, Calif.

Cemented carbides prepared from cobalt powder obtained electrolytically, by reduction of cobalt formate, and from tungsten carbide recovered from scrap. Data on density and hardness. Tables, graphs, micrographs. 9 ref. (H10, Co, W)

123-H. (German.) **Crystal Structure Investigation and Microhardness Determination of High-Tungsten Sintered Alloys of the Tungsten-Chromium-Nickel System.** H. Bückle. *Planseeberichte für Pulvermetallurgie,* v. 3, no. 1, Feb. 1955, p. 2-16.

Influence of different compositions and sintering temperature on the structure and physical properties. Phase diagrams, micrographs, graphs. 10 ref. (H15, M26, Q29, W, Cr, Ni)

124-H. (Russian.) **Use of Thermobattery to Measure the Temperature Effect at the Cathode During the Electrolytic Deposition of Metal Powders.** D. N. Gritsan, A. M. Bulgakova and N. N. Bagrov. *Zhurnal Fizicheskoi Khimii,* v. 29, no. 2, Feb. 1955, p. 345-349.

Apparatus utilizes a differential thermocouple; temperature effect not dependent on size of cathode surface. Graphs, tables. 4 ref. (H10)

J — Heat Treatment

93-J. Standard H-Steels, 5120-H to 6150-H. Data Sheet. *Metal Progress,* v. 67, Apr. 1955, p. 108B.

Hardenability bands for ten alloy steels. Graphs. (J26, AY)

94-J. Vacuum Heat Treating. I. Opportunity Knocks in the Micron Range. Richard L. Hoff and A. M. Bounds. *Steel,* v. 136, Apr. 11, 1955, p. 108-11.

Advantages of vacuum heat treating. Equipment. Photographs, table, graph. 6 ref. (J general)

95-J. Vacuum Heat Treating. II. Remove the Unwanted to Raise Performance Level. Richard L. Hoff and A. M. Bounds. *Steel,* v. 136, Apr. 18, 1955, p. 108-110.

Use of vacuum annealing to remove gases and unwanted compounds. Photographs, tables, graphs. (J23, Zr, Ti)

96-J. Practical Application of Furnace Atmospheres. Charles A. Mueller. *Metal Treating,* v. 6, Mar.-Apr. 1955, p. 2-7, 28.

Use of endothermic, exothermic, dissociated ammonia or dry nitrogen as atmospheres in heat treating operations. Diagrams, graphs, photograph. (J2)

97-J. Batch Carbon Restoration Annealing of Bar Stock. H. W. Callahan. *Metal Treating,* v. 6, Mar.-Apr. 1955, p. 10, 12, 14.

Principal heat treatments carried out in a batch controlled atmosphere furnace. Photographs. (J23, J2)

98-J. (English.) **Oxyacetylene Flame Hardening.** *Aciers Fins & Spéciaux Francais,* 1954, no. 18, Dec., p. 52-61.

A simple and practical means of effecting localized heating of surface of metals. Graph, diagrams, photographs, table. (J2)

99-J. (French.) **Continuous Muffle-Tube Furnaces.** *Métallurgie et la construction mécanique,* v. 87, no. 3, Mar. 1955, p. 209-211.

Application of furnaces in the annealing of soft steel and stainless steel tubes and stainless steel and refractory wires. Photographs. (J23, ST, SS)

100-J. Heat Treatments Standardize Part Structures for Automated Machining Lines. W. J. Behrens. *Iron Age,* v. 175, Apr. 28, 1955, p. 95-97.

Practice of one industrial concern to heat treat all incoming materials to establish uniform structure for its high-speed machining operations. Photographs. (J general, G17, TS)

101-J. Wide Steel Plate Continuously Heat Treated on New Integrated Line. W. D. Latiano. *Iron Age,* v. 175, May 5, 1955, p. 105-108.

The line handles plate to 130 in. wide and 40 ft. long on a continuous basis. Use of major materials handling devices has reduced the over-all time required in heat treating operations. Photographs. (J general, ST)

102-J. Heat Treating of Aluminum. George H. Thurston. *Light Metal Age,* v. 13, Apr. 1955, p. 8-11, 27.

Steps involved and manner in which they deviate from standard ferrous metals practice. Photographs. (J general, Al)

103-J. Steam Heat Treating Boosts Processing Efficiency. Fred L. Spangler. *Steel,* v. 136, May 9, 1955, p. 82-84.

Temper, anneal and stress-relieve in steam atmosphere to get scale-free work. Method imparts wear and corrosion resistance and reduces finishing operations. Photographs, table. (J2, TS)

104-J. Equilibrium Curves. Their Application to Furnace Atmospheres. N. K. Koebel. *Steel Processing,* v. 41, Apr. 1955, p. 247-552.

Brief review and comparison of theoretical equilibrium curves, calculated by means of the phase rule, with the empirical equilibrium curves recently derived by direct measurement methods in industrial furnaces. Graphs. 5 ref. (J2)

105-J. The Production of Patented Wire for Valve Springs. O. Page. *Wire Industry,* v. 22, Apr. 1955, p. 411 + 7 pages.

Consideration of the various problems arising, along with an outline of certain methods of overcoming them. Graphs, micrographs, photographs. (J25, F28, ST)

106-J. (Russian.) **Toughness and Wear-Resistance of Automobile Parts Treated by Gas Cyanding.** A. M. Tarasov and B. A. Stetsenko. *Avtomobil'naia i traktornaia promyshlennost',* 1955, no. 3, Mar., p. 21-24.

Cyaniding techniques; microstructure of treated layer; comparison of gas and liquid processing. Photographs, graphs, tables, micrographs, diagrams. 3 ref. (J28, M27, Q23, Q9)

K — Joining

145-K. Preventing Weld Cracks in 1100° F. Stainless Piping. R. M. Curran and A. W. Rankin. *Heating, Piping & Air Conditioning,* v. 27, Apr. 1955, p. 116-119.

Welding procedure for type 347 stainless. Table, micrographs, graphs. (K1, SS)

146-K. Welding Type 347 Stainless Steel for 1100° F Turbine Operation. R. M. Curran and A. W. Rankin. *Welding Journal,* v. 34, Mar. 1955, p. 205-213.

Special electrode composition and postweld heat treatment employed to produce welds insensitive to sigma phase embrittlement at service temperatures. Photographs, graphs, micrographs, tables. 10 ref. (K1, SS)

147-K. Automatic Percussion Welding of Telephone Relay Contacts. A. L. Quinlan. *Welding Journal,* v. 34, Mar. 1955, p. 237-240.

Technique proves successful, in this application, with accuracy of location and good weld strength being obtained. Method is useful for high-speed automatic welding; metals of high thermal and electrical conductivity join readily. Photographs, graph, micrograph. (K5)

148-K. Selection of D-C Arc Welding Power Sources. A. U. Welch. *Welding Journal,* v. 34, Mar. 1955, p. 241-245.

Lesser known factors involved in choice of rectifiers vs. motor-generators d.c. arc welders, Oscillograms, photograph. (K1)

149-K. Seam Welding Low-Carbon Steel. M. L. Begeman and Gene C. Walker. *Welding Journal,* v. 34, Mar. 1955, p. 123S-131S.

Development of basic procedure data for fabrication of pressure-tight lap seam-welded joints in low carbon steel sheets. Tables, photographs, micrographs, graphs, radiographs. (K3, CN)

150-K. The Flash Welding of Commercial Molybdenum. I. Temperature Distribution During Parabolic Flashing of ½-In. Sintered-and-Wrought Molybdenum Rods. Ernest F. Nippes and Wen H. Chang. *Welding Journal,* v. 34, Mar. 1955, p.132S-140S.

Experimental results compared with and substantiated by findings of microscopic examination. Micrographs. photograph, diagram, tables, graphs. 11 ref. (K3, Mo)

151-K. (German.) **The Adhesion of Metals.** E. Frischbier and W. Schäfer. *Plaste und Kautschuk,* v. 2, no. 2, Feb. 1955, p. 28-33.

Types and properties of metal adhesives. Photographs, diagrams, graphs. 58 ref. (K12)

152-K. (German.) **Silox Brazing Process for Cast Iron.** Benno Sixt. *Schweisstechnik,* v. 9, no. 1, Jan. 1955, p. 1-5.

Process of joining cast iron with specially developed brass rods and fluxes. Diagrams, photographs, graph. (K8, CI)

153-K. Practical Control in the Welding of Alloy Steels. I. C. Fitch. *British Welding Journal,* v. 2, Apr. 1955, p. 151-158.
Methods of determining whether a steel is weldable; how to establish conditions necessary for welding successfully. Graphs, table, diagrams, photographs. 14 ref.
(K9, AY)

154-K. Oxy-Acetylene Pressure Welding of Aircraft Undercarriage Components. D. C. Brown and J. J. Wilson. *British Welding Journal,* v. 2, Apr. 1955, p. 160-171.
Preliminary experimental work leading to production of a large pressure-welded undercarriage. Photographs, diagrams, tables, graphs. 2 ref. (K2)

155-K. Bronze Welding of Steel. E. Ryalls. *British Welding Journal,* v. 2, Apr. 1955, p. 175.
Used to join a variety of similar and dissimilar ferrous and nonferrous metals at a temperature below that of the melting point of the parent metal. Diagrams. (K8, Cu)

156-K. Measurement of Resistance-Welding Variables. J. E. Roberts. *British Welding Journal,* v. 2, Apr. 1955, p. 176-180.
Methods of measuring current, time and electrode force. Diagram, photographs, circuit diagrams. 5 ref. (K3)

157-K. Welding Aluminum. IV. Spot Welding. Charles Bruno. *Heating, Air Conditioning, Sheet Metal Contractor,* v. 46, Apr. 1955, p. 56-63.
Procedures which differ somewhat from conventional methods. Photographs, tables. (K3, Al)

158-K. Mechanized Argon-Arc Welding. G. D. Chapman. *Light Metals,* v. 18, Apr. 1955, p. 115-121.
Analysis of current trends of production equipment selected to cover a broad range of welding operations in aluminum alloys. Tables, photographs, diagram. 6 ref. (K1, Al)

159-K. New Aluminum-Ceramic Bond Produces Hermetic Seal. George W. Hume. *Materials & Methods,* v. 41, Apr. 1955, p. 110-111.
A technique that produces a satisfactory high-temperature seal between ceramic materials and aluminum and its alloys. Photographs, micrographs, table, diagram.
(K11, Al)

160-K. Hard Soldering Aluminium. *Metal Industry,* v. 86, Apr. 15, 1955, p. 289.
Process for corrosion resistant medium-temperature work. Photographs. (K7, Al)

161-K. Recent Developments in Rubber-to-Metal Bonding. Howard H. Irvin and William H. Cornell. *Rubber World,* v. 132, Apr. 1955, p. 55-61.
A new system, effective in bonding the most widely used elastomers, is insensitive to disturbing variations in atmospheric conditions, and is effective for bonding at high temperatures with short curing cycles. Tables, diagram, graphs, photographs. (K11)

162-K. Projection Welding. Ralph H. Eshelman. *Tool Engineer,* v. 34, May 1955, p. 109-118.
Adaptability of automatic assembly to production and other applications. Photographs, diagrams, tables. (K3)

163-K. Automatic Arc Welding. J. A. Lucey. *Welding and Metal Fabrication,* v. 23, Apr. 1955, p. 116-121.
Advantages and field of application. Photographs, tables. (K1)

164-K. Automatic Sigma Welding. D. B. Tait. *Welding and Metal Fabrication,* v. 23, Apr. 1955, p. 127-129.
Weld is protected from atmospheric oxidation by shield of inert gas. Photographs, graph. (K1)

165-K. (French.) **Temperature of Transition of Brittleness, Criterion of Quality of Arc Welding Electrodes.** Daniel Séférian and Marcel Moneyron. *Revue de métallurgie,* v. 52, no. 3, Mar. 1955, p. 219-236; disc., p. 236.
Effect of electrode coating upon transition temperature. Tables, graphs, micrographs, diagrams. 17 ref. (K1, Q23)

166-K. (German and French.) **Current Brazing Problems.** Jakob Colbus. *Zeitschrift für Schweisstechnik,* v. 45, no. 2, Feb. 1955, p. 27-35.
Review of brazing research in Switzerland. Diagrams, micrographs, graphs, table. 8 ref. (K8)

167-K. (German.) **Contribution to the Formation of Titanium Nitrides in Welds of Rutile Type Coated Electrodes.** W. Hummitzsch and L. Hense. *Schweissen und Schneiden,* v. 7, no. 3, Mar. 1955, p. 79-85.
Improving influence of special nitrides on quality of welds. Tables, graphs. 6 ref. (K1)

168-K. (German.) **Examples of Application of the Silox Soldering Process.** Benno Sixt. *Schweisstechnik,* v. 9, no. 2, Feb. 1955, p. 17-20.
Methods and advantages of soldering gray iron castings. Photographs. (K7, CI)

169-K. (German.) **Modern Metal Joining Using Glue and Its Strength.** E. W. Pleines. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 160-171.
Technique of operation and importance of the method, particularly for light alloys. Drawings, tables, stress pattern, photographs. 11 ref. (K12, EG)

170-K. (Russian.) **Welding of High-Strength Cast Iron Containing Spheroidal Graphite.** V. V. Bazhenov, L. M. Iarovinskii, and A. D. Kuznetsova. *Svarochnoe Proizvodstvo,* 1955, no. 3, Mar., p. 1-5.
Variation of cast iron hardness with quenching at different temperatures; mechanical properties of welded seams and their microstructure when iron-nickel and other electrodes are used; effect of heat treatment. Graph, tables, micrographs. 5 ref. (K1, CI)

171-K. (Russian.) **Welding of Pipes Consisting of Two Layers, One of Which is Rust-Proof.** N. Iu. Pal'chuk. *Svarochnoe Proizvodstvo,* 1955, no. 3, Mar., p. 5-7.
Problems involved and types of welding recommended. Tables, photographs, micrographs, diagram. 2 ref. (K general, ST)

172-K. (Russian.) **Welding of Pipes of Heat-Resistant Chromium-Molybdenum Steel 12 X 5MA.** L. S. Livshits, A. G. Mazel', M. Ia. Chushenkova and L. P. Bakhrakh. *Svarochnoe Proizvodstvo,* 1955, no. 3, Mar., p. 8-10.
Types of electrodes used; condition and pre-treatment of welded parts; microstructure of welded zone. Micrographs, tables.
(K1, M27, AY)

173-K. (Russian.) **Experiment in the Automatic Welding of Two-Layer Steel Vessels.** F. S. Bugrii. *Svarochnoe Proizvodstvo,* 1955, no. 3, Mar., p. 16-18.
Techniques for fusing the rust resistant steel seam into the low carbon steel. Photographs, diagrams, micrographs. 2 ref.
(K1, SS, CN)

174-K. (Russian.) **Electric Arc Welding of Lead and Aluminum Bronzes and of Siliceous Brass.** I. P. Doronin and V. M. Sventitskii. *Svarochnoe Proizvodstvo,* 1955, no. 3, Mar., p. 18-21.
Types of electrodes, weld thicknesses, conditions, chemical composition of bronzes and brasses, microstructure. Micrograph, photographs, tables. 3 ref.
(K1, Al, Cu, Pb, Mn, Zn, Fe, Sn)

175-K. (Spanish.) **Contribution to the Problem of Nonmetallic Inclusions in Deposited Metal.** J. M. Sistiaga and W. Koch. *Ciencia y técnica de la Soldadura,* v. 4, no. 21, Nov.-Dec. 1954, 7 p.
Study of deoxidation processes in deposited metal in the electric arc welding of carbon steels. Chemical and morphological examination of nonmetallic inclusions. Tables, diagram, graph, micrographs. 9 ref.
(K1, CN)

176-K. (Spanish.) **Electric Projection Welding.** Evert H. Bykin. *Ciencia y técnica de la Soldadura,* v. 4, no. 21, Nov.-Dec. 1954, 13 p.
Factors and conditions that contribute to good results from electric resistance welding; equipment used and possible applications. Diagrams, graphs. (K3)

177-K. (Spanish.) **Problem of Cracking During the Arc Welding of Alloy Steels.** F. Donis Ortiz. *Ciencia y técnica de la Soldadura,* v. 4, no. 21, Nov.-Dec. 1954, 10 p.
Study of metallographic structures, uses of adequate electrodes, preparation of joints, preheating and heat treatments in examination of cracking in nickel and manganese steels. Graphs, micrograph.
(K1, AY)

178-K. Hard Soldering. W. J. Smellie. *Aircraft Production,* v. 17, May 1955, p. 181-185.
Methods for joining aluminum by heating the suitably prepared surface and applying to it solder or brazing-alloy in the molten condition. Unlike welding, no fusion of parent aluminum is involved. Photographs, micrographs, tables, diagrams. 4 ref. (K7, Al)

179-K. Are You Ready to Weld Titanium? Orville T. Barnett. *Industry & Welding,* v. 28, May 1955, p. 63 + 6 pages.
Inert-gas metal-arc welding and resistance welding described. Atmosphere contamination, joining techniques and choice of inert atmosphere are discussed. Table.
(K1, K3, Ti)

180-K. Wrought Carbon and Alloy Steel: Weldability. Helmut Thielsch. *Machine Design,* v. 27, May 1955, p. 166-172.
Evaluation of effects of variations in welding processes and materials. Recommended welding procedures. Photographs, tables. (K9, LN, AY)

181-K. Hidden-Arc Welding Improves Reel Design. *Modern Machine Shop,* v. 27, May 1955, p. 124-127.
Design and fabricating angle employed in producing large dresser reels for the textile industry. Photographs. (K1)

182-K. What's Ahead for Titanium Fasteners. James B. Duke. *Modern Metals,* v. 11, Apr. 1955, p. 46 + 3 pages.
Progress made in developing titanium aircraft locknuts. Problems remaining to be solved before the weight saving advantages of such parts can be realized at reasonable costs. Tables, photographs.
(K13, Ti)

183-K. Old Gas—New Application. T. B. Jefferson. *Welding Engineer,* v. 40, May 1955, p. 36-38.
With the addition of carbon dioxide, the Mig welding process now employs three inert gases. But because carbon dioxide is so much cheaper, it may soon overtake argon and helium in the popularity race. Table, photographs, graphs. (K1)

184-K. Low-Heat Welding of Cast Iron. Arthur L. Phillips. *Welding*

Engineer, v. 40, May 1955, p. 47-48, 57.

Quickest and most economical and satisfactory method of joining or repairing castings. Photographs. (K1)

185-K. The Heat-Affected Zone in Arc-Welded Type 347 Stainless Steel. E. F. Nippes, H. Wawrousek and W. L. Fleischmann. *Welding Journal,* v. 34, Apr. 1955, p. 169S-179S.

An investigation to establish the properties of Type 347 in regions adjacent to arc welds to determine the effect of these properties upon the behavior of weldments at elevated temperatures. Photographs, tables, oscillograph, graphs, diagram, micrographs. 17 ref. (K1, SS)

186-K. Welding Procedure Qualification Tests for Six High-Yield-Strength Steels. A. P. Bunk. *Welding Journal,* v. 34, Apr. 1955, p. 197S-206S.

Qualification procedure tests to establish suitable welding procedures for six high-strength pressure-vessel steels. Diagrams, tables, photographs. 2 ref. (K9, ST)

187-K. Recent Developments on Contact Electrodes. D. L. Mathias. *Welding Journal,* v. 34, Apr. 1955, p. 316-328.

Characteristics of the contact electrode offer possibilities for cost reduction through increased deposition rate, reduced cleaning costs and greater welder appeal. Photograph, tables, diagrams, graphs. 3 ref. (K1)

188-K. An Improved Method of Oxy-Fuel Combustion. E. H. Roper. *Welding Journal,* v. 34, Apr. 1955, p. 337-344.

Higher heat release and higher gas velocity than previously used commercially reported for improved type oxy-fuel gas burner. New concepts of welding, cutting, flame hardening and descaling. Diagrams, photographs, tables. (K2, G22, J2)

189-K. On the Mechanism of Starting the Arc in Electric Welding. M. Ya. Broun and G. I. Pogodin-Alekseev. *Henry Brutcher Translation No.* 2892, 6 p. (From *Avtogennoe Delo,* v. 22, no. 8, 1951, p. 16-17.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 373-K, 1952. (K1)

190-K. (German.) **Fusion Welding of Malleable Aluminum Materials.** H. A. Horn. *Metall,* v. 9, nos. 7-8, Apr. 1955, p. 283-287.

Characteristics of the aluminum welding process; techniques and applications. Tables, diagrams, photographs. 4 ref. (K1, Al)

191-K. (Book—German.) **Materials and Welding. Handbook on Materials and Techniques of Welding.** Friedrich Erdmann-Jesnitzer, editor. v. II. 617 p. 1954. Akademie-Verlag, 39 Mohrenstrasse, Berlin, Germany. $10.00

Welding methods for ferrous and nonferrous metals and alloys; postwelding heat treatment; testing procedures; structure and property changes. (K general)

L

Cleaning, Coating and Finishing

288-L. A New Technique for Simultaneous Recording of Strains and Temperature in Enamel-Metal Systems. J. H. Lauchner, R. L. Cook and A. I. Andrews. *American Ceramic Society Bulletin,* v. 34, Apr. 1955, p. 105-108.

Photo-electric cell incorporated as means of measuring strains. Photographs, diagrams, graphs. 5 ref. (L27, Q25)

289-L. The Determination of Boric Acid in Nickel Plating and Acid Zinc Plating Baths by Means of Cation Exchangers. Gunnar Gabrielson. *American Electroplaters' Society Proceedings,* v. 41, 1954, p. 23-26.

Removing nickel ions by percolating the solution through a layer of a hydrogen saturated cation exchanger. Tables. 5 ref. (L17, Ni, Zn)

290-L. Precision Barrel Finishing. Malcolm M. Maynes. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 27-32.

Method of deburring and surface finishing metal parts. Photographs. (L10)

291-L. Radiometric Study of Supplementary Chromate Coatings for Zinc and Cadmium Plating. Stanley L. Eisler, Jodie Doss and Mary Ann Henderson. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 33-40.

Radiosulfur and radiochromium used to determine amounts of sulfate and chromium contained in coatings produced from various supplementary dip solutions. Tables. 5 ref. (L14, Zn, Cd)

292-L. Bicycle Horns Coated by Vacuum Metallizing. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 46-49.

Horns finished by depositing thin layer of aluminum under vacuum in the metallizer. Photographs. (L25, Al)

293-L. The Polarographic Analysis of Nickel Plating Solutions. J. V. Petrocelli and G. Tatoian. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 50-56.

General principles and techniques. Circuit diagram, graphs, photograph, tables. 9 ref. (L17, S11, Ni)

294-L. The Use of Unplasticized Polyvinyl Chloride in Electroplating Plants. Laurence N. Thomas. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 57-62.

Uses and applications suggested to users of chemical processing and allied equipment. Photographs, tables. (L26, L17)

295-L. Current Density Distribution in Electroplating by Use of Models. Gilbert Ford Kinney and John V. Festa. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 66-70.

Methods by which the current distribution can be controlled. Diagrams, graphs. 2 ref. (L17)

296-L. Tentative Recommended Practice for Preparation of Copper and Copper-Base Alloys for Electroplating. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 71-75.

A guide for platers in setting up suitable cleaning and conditioning cycle preparatory to electroplating. 1 ref. (L17, Cu)

297-L. Metal Reflector Finishing. E. B. Heyer. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 76-78.

Finishing operations performed on metal reflectors. Photographs. (L general, Ni, Al, Rh)

298-L. Nickel Plating Troubles and Cures. O. A. Stocker, A. Korbelak and S. A. Carrano. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 83-88.

Chart covering nickel plating trouble shooting. (L17, Ni)

299-L. Radiometric Study of the Chromium-Sulfate Complex Formed in Chromium Plating Baths. Ronald L. Sass and Stanley L. Eisler. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 89-93.

Determination of ionic nature of coordination complex formed and amount of sulfate so complexed. Tables. 11 ref. (L17, Cr)

300-L. Voltage and Current Fluctuations in the Output of Plating Rectifiers. V. L. Richards. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 107-115.

Data on voltage and current fluctuations in the output of selenium plating rectifiers. Graphs, tables. (L17, Se)

301-L. The American Electroplaters' Society Research Program. Earl J. Serfass. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 185-187.

Review of active and inactive projects and the results of activities. Tables. (L general, A9)

302-L. Copper-Tin Alloy Plating. W. H. Safranek and C. L. Faust. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 201-208; disc., p. 208.

Copper-tin alloy plates in composition range of 17 to about 50% tin, the balance copper, exhibited good leveling properties and good protection against corrosion. Bronze plus chromium plates greatly superior to copper plus chromium. Because of good performance, bronze alloy is being considered seriously as a replacement for nickel plate. Tables, micrographs, photographs. 12 ref. (L17, Cu, Sn)

303-L. A Large-Scale Electroless Nickel Custom Plating Shop. G. Gutzeit and R. W. Landon. *American Electroplaters' Society, Proceedings,* v. 41, 1954, p. 256-260; disc., p. 260-261.

Commercial application of electroless nickel coatings. Flowsheets, photographs. 3 ref. (L14, Ni)

304-L. The Anodic Treatment of Aluminum in Sulfuric Acid Solutions. Roy C. Spooner. *Electrochemical Society, Journal,* v. 102, Apr. 1955, p. 156-162.

Effect of process variables on coating properties. Graphs, table. 10 ref. (L19, Al)

305-L. Relation of Color to Certain Characteristics of Anodic Tantalum Films. A. F. Torrisi. *Electrochemical Society, Journal,* v. 102, Apr. 1955, p. 176-180.

Color of anodic film defines voltage and temperature conditions of formation, which, in turn, determine properties of the coating. Tables, graphs. 7 ref. (L19, Ta)

306-L. The Electroforming of Components and Instruments for Millimetre Wavelengths. A. F. Harvey. *Institution of Electrical Engineers, Proceedings,* v. 102, pt. B, no. 2, Mar. 1955, p. 223-230.

Development of improved methods and processes. Table, photographs, diagrams. 24 ref. (L18)

307-L. Instrumentation: Controlled Measurement Lowers Pickling Costs. D. H. Krouse. *Iron Age,* v. 175, Apr. 7, 1955, p. 132-134.

Measurement and control of fresh acid addition to pickling processes through use of modern instrumentation. Diagrams. (L12)

308-L. A Method for the Preparation of Thin Films of Plutonium and Uranium. K. M. Glover and P. Borrell. *Journal of Nuclear Energy,* v. 1, Feb. 1955, p. 214-217.

Directions for making up solutions for painting foils and coating the fission counters by a dipping process. Diagram. 2 ref. (L16, Pu, U)

309-L. Electroplating on Magnesium. H. K. DeLong. *Metal Progress,* v. 67, Apr. 1955, p. 102-108.

Success of electroplating magnesium is dependent almost entirely on using a preplate of zinc and on adhesion and uniformity of initial coating. Subsequent coatings can be applied according to standard plating practice. Photographs, graphs, table. (L17, Mg)

310-L. Yellow Brass Plating. E. J. Roehl, E. Michel and L. R. Westbrook. *Plating,* v. 42, Apr. 1955, p. 403-405.

Process by which high electrode efficiencies can be obtained at high current densities. Table, graphs. (L17, Cu)

311-L. The Measurement of Current Distribution in an Acid Copper Plating Solution. E. J. Wilhelm and Richard F. Kayser. *Plating,* v. 42, Apr. 1955, p. 406-412.

Method of measuring current distribution on cathode with aid of small probe electrode. Tables, diagrams, graphs. 5 ref. (L17, Cu)

312-L. Notes on Experiments in Electrodeposition With Perfluorinated Acids. John K. Taylor and Abner Brenner. *Plating,* v. 42, Apr. 1955, p. 413-414.

Value of perfluorinated acids in forming plating baths. Tables. (L17, Cr, Ni, Co)

313-L. The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating. II. Correlated Abstracts. A. E. R. Westman and F. A. Mohrnheim. *Plating,* v. 42, Apr. 1955, p. 417-421.

Covers nature, surface, microgeometry, crystal orientation, polish, stresses and corrosion of the basis metal. 198 ref. (L17)

314-L. Cleaning and Preparation of Steel Prior to Finishing. *Stove and Appliance Builder,* v. 20, Apr. 1955, p. 72-77.

To obtain full benefit from finishing materials, correct pretreatment of steel surfaces is essential. Tables. (L10, L12, ST)

315-L. Practical Hard Facing With Fused Self-Fluxing Metallized Coatings. Harvey S. Miller. *Welding Journal,* v. 34, Mar. 1955, p. 214-219.

"Spraywelding" technique involves four different stages; preparation of surface, spraying of deposit, fusing of deposit and finishing. Photographs. (L24, Cn, SS, Ni, Cr, B)

316-L. Pack Chromizing of Steel in a Compound Containing Chromium Sesquioxide. G. N. Dubinin. *Henry Brutcher Translation No.* 3466, 7 p. (From *Vestnik Mashinostroeniya,* v. 34, no. 11, 1954, p. 56-58.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 156-L, 1955. (L15, Cr, ST)

317-L. (German.) **Protection of Aluminum From Corrosion by Natural or Augmented Oxide Films: Recent Research.** D. Altenpohl. *Metall,* v. 9, nos. 5-6, Mar. 1955, p. 164-171.

Effectiveness of natural and artificial films; relation between oxide film and aluminum potential. Tables, diagrams, graphs. 33 ref. (L14, Al)

318-L. (German.) **Cyanide Copper Baths, Especially High-Speed Baths.** Heinz W. Dettner. *Metalloberfläche,* Ausgabe B, v. 7, no. 3, Mar. 1955, p. 33-35.

Compositions of and results from different copper-plating baths. Tables. 15 ref. (L17, Cu)

319-L. (Russian.) **Joint Release of Copper and Hydrogen During the Electrolysis of Complex Solutions.** E. A. Ukshe and A. I. Levin. *Doklady Akademii Nauk SSSR,* v. 100, no. 5, Feb. 11, 1955, p. 943-946.

Mathematical treatment of the discharge theory. Graphs. 9 ref. (L17, Cu)

320-L. (Russian.) **Experiment in the Use of "Asbovinyl" as a Corrosion-Resistant Material.** A. I. Rychkov and I. Ia. Klinov. *Khimicheskaia Promyshlennost',* 1954, no. 8, Dec., p. 492-493.

Protective coating identified as ethynol lac and ground asbestos for tanks and machine parts in sulfite cellulose plants, etc. Table. (L26)

321-L. (Russian.) **Thermal-Diffusion Sulfiding of Steels.** V. V. Gal'chenko. *Stanki i Instrument,* v. 26, no. 2, Feb. 1955, p. 17-19.

Sulfur diffusion coatings for steel rollers. Coating methods. Tables. 3 ref. (L15, ST)

322-L. The Use of Filters in Electroplating. J. B. Mohler and Charles E. Crowley. *Electrotypers and Stereotypers Magazine,* v. 41, Apr. 1955, p. 5 + 5 pages.

Sources of contamination, rough deposits, filtering methods and filtering rates. Diagrams, table. (L17)

323-L. Tin Fluoborate Plating. J. B. Mohler. *Metal Finishing,* v. 53, Apr. 1955, p. 59-61.

Addition agents; baths; operating procedures. Graphs, photograph. 10 ref. (L17, Sn)

324-L. Coatings and Coating Methods for Aluminum Foil. I. O. Robertson, Jr. *Paper, Film and Foil Converter,* v. 29, May 1955, p. 25-29.

Purposes, applications and coating techniques. Photograph, diagrams. (L general, Al)

325-L. Surface Treatment and Finishing of Light Metals. X. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 32, no. 336, Apr. 1955, p. 273-283.

Electrodeposition on aluminum, tests for electroplated aluminum; immersion coatings. Review of the corrosion resistance of various coatings. Photographs, graphs, micrographs, diagrams, tables. 57 ref. (To be continued.) (L17, L16, R general, Cu, Zn, Cd, Ag, Cr, Ni, Al)

326-L. Porcelain Enamels for Aluminum. James I. Mueller. *Trend in Engineering, (University of Washington),* v. 7, Apr. 1955, p. 21-24.

Satisfactory enamel may be obtained from either a highly fluoro or borosilicate glass, or from a phosphate glass; results indicate development possibilities of good lead-free coatings. Photographs, tables. 16 ref. (L27, Al)

327-L. New Aluminizing Process for Steel Wire. Bernard S. Westerman. *Wire and Wire Products,* v. 30, Apr. 1955, p. 419-421, 483-485.

Process which is practicable from production standpoint as well as economical in cost. Photographs, diagram. (L15, Al)

328-L. (English.) **Cathode Film Studies by the Drainage Method.** A. Brenner and G. Wranglén. *Svensk Kemisk Tidskrift,* v. 67, no. 2, 1955, p. 81-85.

In measuring the pH of the cathode film in nickel deposition by the "drainage method", results obtained were found to be highly dependent on drainage time. Graphs. 4 ref. (L17, Ni)

329-L. (Czech.) **Diffusion Chromizing of Steel.** E. Gasior. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 1-10.

Development of steel protection by chromium diffusion. Theoretical aspects of chromizing process and principal properties of protective coatings obtained. Graphs, tables. 32 ref. (L15)

330-L. (Czech.) **Inmet Oil as a Lubricant for Hot Tin-Plating of Iron Sheets.** J. Foryst, J. Madejski and I. Zarzycki. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, no. 1, 1955, p. 11-16.

Laboratory and industrial tests on a substitute lubricant for hot tinplating of iron sheets. Tables, graphs, micrographs, diagram. 4 ref. (L17, Sn)

331-L. (German.) **Influencing the Silicon Impregnation of Steel by Different Alloying Elements.** Erich Fitzer. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 159-169.

Protection of steel against scaling and corrosion by surface diffusion of different metals and by surface reactions with vapor mixtures of the subchlorides of silicon, aluminum and titanium protection of chromium steels against vanadium pentoxide corrosion. Micrographs, tables, graphs. 24 ref. (L15, ST)

332-L. (German.) **Metal Coating of Glass, Porcelain and Other Ceramic Products in High Vacuum.** H. Kalpers. *Sprechsaal,* v. 88, no. 6, Mar. 1955, p. 112-113.

Equipment and operation. Table, photographs. (L25)

333-L. (Italian.) **Hard Coating of Pure and Alloyed Aluminum.** F. Sacchi. *Alluminio,* v. 24, no. 1, Jan. 1955, p. 5-15.

Discussed in view of the mechanical exploitation of the resulting surface properties. Tables, photographs, micrographs. 9 ref. (L24, Al)

334-L. (Russian.) **Investigation of Cathode Processes in Chromium Electroplating.** A. I. Levin and A. I. Falicheva. *Zhurnal Fizicheskoi Khimii,* v. 29, no. 1, Jan. 1955, p. 95-104.

Influence of chromium trioxide concentration on polarization of platinum chromium cathodes. Graphs. 17 ref. (L17, Cr, Pt)

335-L. (Russian.) **Cathode Polarization During Galvanic Tinplating, From Chloride Electrolytes.** I. E. Gurevich. *Zhurnal Prikladnoi Khimii,* v. 28, no. 3, Mar. 1955, p. 285-290.

Effects resulting from gelatin, alpha-naphthol, cresol or other additions on cathode polarization in relation to current density. Graphs, tables. 7 ref. (L17, Sn)

336-L. Comparative Cleaning by Diphase Cleaners and Alkaline Salts. Lloyd Osipow, Herbert Pine, Cornelia T. Snell and Foster Dee Snell. *Industrial and Engineering Chemistry,* v. 47, Apr. 1955, p. 845-847.

Diphase cleaners were superior; alkaline salts improved with higher temperatures on synthetically soiled steel panels. Tables, graphs. 3 ref. (L12, ST)

337-L. Coating Pipelines in Place Internally With Plastics. J. C. Watts. *Corrosion,* v. 11, May 1955, p. 210-216.

Cleaning processes, methods of application, materials used and results obtained. Graphs, photographs, diagram, tables. (L27)

338-L. Electric Equipment for Aluminum Anodizing. D. C. Griffith. *Electrical Engineering,* v. 74, May 1955, p. 384-387.

Equipment and advantages described, together with background information on the processes themselves. Photographs, diagrams, graph. 11 ref. (L19)

339-L. The Crystallization of Anodic Tantalum Oxide Films in the Presence of a Strong Electric Field. D. A. Vermilyea. *Electrochemical Society, Journal,* v. 102, May 1955, p. 207-214.

Nature of the crystals and the mechanism of their growth. Graphs, micrographs, tables. 3 ref. (L19, Ta)

340-L. Stress During the Electrodeposition of Copper on Copper Substrate. Hussein Sadek, M. Halfawy and S. G. Abdu. *Electrochemical Society, Journal,* v. 102, May 1955, p. 226-228.

Effect of current density, time and coating composition and thickness on deflection of copper strips. Graphs. 14 ref. (L17, Cu)

341-L. Electroplating in Western Germany. I. Robert Pinner. *Electroplating and Metal Finishing,* v. 8, Apr. 1955, p. 131-135.

Organization, trade position and structure of the plating industry. Map, photographs. 2 ref. (To be continued) (L17)

342-L. Automation in the Plating Industry. II. Productivity and Cost Control in Metal Finishing. H. Silman. *Electroplating and Metal Finishing,* v. 8, Apr. 1955, p. 136-139.

Discussion of 'through-type' plating machines with special reference to the Duplex Carriage, and 'Vertical Lift Return-Type' plants. Photographs, diagram. (To be continued) (L17, A5)

343-L. An Experimental Investigation of the Metal Spraying Process. A. Matting and K. Becker. *Electroplating and Metal Finishing,* v. 8, Apr. 1955, p. 143-145.

Mechanisms of the metal spraying process and results obtained in investigations of the processes taking place at the wire end. Diagrams, photographs. (L23)

344-L. Progress in Barrel Finishing. I. The Development and Technique of Barrel Finishing. C. J. A. Kellard. *Electroplating and Metal Finishing,* v. 8, Apr. 1955, p. 149-152.

Modern progress with barrel finishing media and compounds and a summary of the effects of operating variables on the process. 4 ref. (L10)

345-L. The Protective Function of Paint Coatings on Metals. P. J. Gay. *Electroplating and Metal Finishing,* v. 8, Apr. 1955, p. 153-156.

Some of the properties of surface treatments and of paint coatings, with reference to electrochemical corrosion processes. 7 ref. (L26)

346-L. The Surface Areas of Evaporated Metal Films. B. M. W. Trapnell. *Faraday Society, Transactions,* v. 51, Mar. 1955, p. 368-370.

Measures area per unit weight of nickel, iron, rhodium, molybdenum, tantalum and tungsten evaporated films. Table, graph. 8 ref. (L25, Ni, Fe, Rh, Mo, Ta, W)

347-L. Development, Evaluation of an Orange Enamel of Improved Light Fastness. William A. Gottfried. *Finish,* v. 12, May 1955, p. 50-51.

Investigation undertaken to develop light, stable international orange-colored coatings for use on metals, and also to develop a suitable rapid method for measuring color change. Tables. (L27)

348-L. Abrasives, Their Use in Surface Preparation. P. C. Bardin. *Industrial Finishing,* v. 31, Apr. 1955, p. 44 + 4 pages.

Abrasive application methods, types and grades. Photographs. (L10)

349-L. Mass Production Methods Spur Industrial Use of Refractory Ceramic Coatings. F. D. Shaw. *Iron Age,* v. 175, Apr. 21, 1955, p. 97-99.

Modern coatings allow substitution of lighter gage metals, sometimes permit mild steels to replace higher alloy grades. Photographs. (L27, CN)

350-L. Proper Handling Devices Aid Batch Pickling. W. A. Risher. *Iron Age,* v. 175, May 12, 1955, p. 95-97.

Design of sling chains, hooks and fabricated carriers used in batch-type pickling operations. Photographs. (L12)

351-L. Potential at Zero Charge for Reversible and Ideal Polarized Electrodes. Paul Rüetschi and Paul Delahay. *Journal of Chemical Physics,* v.23, Apr. 1955, p. 697-699.

Accounts for differences between experimental potentials at zero charge as obtained with reversible and ideal polarized electrodes. Graph, diagram. 30 ref. (L17)

352-L. Butyl Titanate Heat and Corrosion Resistant Paints. A. B. Cox and G. Winter. *Paint Manufacture,* v. 25, Apr. 1955, p. 146-150.

New developments, formulations and applications on land, sea, and air. Table, photograph. 4 ref. (L26)

353-L. Coating *Will* Protect Cooling Tower Headers. R. L. Elkins and G. O. Hult. *Pipe Line Industry,* v. 2, May 1955, p. 54-57.

Protective coatings, if applied properly and in sufficient film thicknesses, will control corrosion of piping headers to cooling towers. Photographs, table. (L26)

354-L. Porosity of Nickel Deposits By Autoradiographic Techniques. Russell H. Wolff, Mary Ann Henderson and Stanley L. Eisler. *Plating,* v. 42, May 1955, p. 537-544.

Determination of porosity by plating the nickel over an electrodeposit containing radio-active iron. Photographs, table, autoradiographs. 11 ref. (L17, S15, Fe, Ni)

355-L. Zinc and Cadmium Plating. W. H. Millward. *Plating,* v. 42, May 1955, p. 545-549.

Baths, equipment and procedures for automatic and still-vat cadmium and still-vat zinc plating. (L17, Cd, Zn)

356-L. Polarographic Determination of Copper in Cyanide. J. V. Petrocelli and G. Tatoian. *Plating,* v. 42, May 1955, p. 550-552.

Procedure and data for rapid determination of copper in cyanide and acid copper plating baths. Tables, graphs. 3 ref. (L17, S11, Cu)

357-L. Surface Treatment of Metals With Peroxygen Compounds. Paul H. Margulies. *Plating,* v. 42, May 1955, p. 561-566.

Equipment, baths and procedures for various dip finishes for cadmium, silver, steel, aluminum and other metals. Photographs, micrographs. (L16, Al, Cd, Ag, ST)

358-L. Applying Direct Chromium Plate on Zinc. *Precision Metal Molding,* v. 13, May 1955, p. 53-54.

Operations necessary to produce a finished part ready for assembly. Photographs. (L17, Cr, Zn)

359-L. Bright-Dip Line for Aluminum or Brass. *Steel,* v. 136, May 2, 1955, p. 108-109.

Automatic line can adjust its sequence for brass or aluminum. Diagram, photographs. (L16, Al, Cu)

360-L. Aluminum Castings Get a Glassy Coat. *Steel,* v. 136, Apr. 25, 1955, p. 114, 116.

Enamel can be drilled or sawed without chipping; bare aluminum areas can be welded without disturbing the adjacent coating. Photographs. (L27, Al)

361-L. Felt in Metal Finishing. L. D. Gruberg. *Steel Processing,* v. 41, Apr. 1955, p. 237-240.

Precision finishing, grinding, polishing and buffing operations in the metals industries. Photographs. (L10)

362-L. Tin Plating With Potassium Salts. Frederick A. Lowenheim. *Tin and Its Uses,* 1955, no. 31, p. 7-10.

Inventor expresses his views on advantages of potassium stannate tin-plating bath process. Graphs, table. 9 ref. (L17, Sn)

363-L. Automatic Hard Facing With Mild Steel Electrodes and Agglomerated Alloy Fluxes. J. S. McKeighan. *Welding Journal,* v. 34, Apr. 1955, p. 301-308.

Mechanics of process, equipment required and its operation, economies of the process, and a few general procedure suggestions. Photographs, diagram, table. (L24, ST)

364-L. Fused-in-Place Spray Metallized Coatings. Sam Tour. *Welding Journal,* v. 34, Apr. 1955, p. 329-336

Methods of metallizing and fusing, metallurgical nature and service applications for several spray metallized coatings. Photograph, diagram, micrographs, table. (L23)

365-L. Influence of Anode Shape on Uniformity of Deposits in Nickel Plating. D. Mojert. *Henry Brutcher Translation No.* 2863, 5 p. (From *Metall,* v. 5, nos. 17-18, 1951, p. 388-392.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 803-L, 1951. (L17, Ni)

366-L. Metallizing With Copper Carbonyl. E. Crivelli. *Henry Brutcher Translation No.* 2902, 9 p. (From *La Chimica,* v. 17, no. 4, 1941, p. 185-186.) Henry Brutcher, Altadena, Calif.

Use of copper carbonyl for the coating of various organic objects with copper. (L14, Cu)

367-L. Effect of Ripple in Rectified Alternating Current Upon the Formation of Electrodeposits. M. E. Beckmann and F. Maass-Graefe. *Henry Brutcher Translation No.* 3025, 19 p. (From *Metalloberfläche,* v. 5, no. 11, 1951, p. A161-A169.)

Previously abstracted from original. See item 153-L, 1952. (L17, Sn, Cu, Ni, Cr)

368-L. Large-Sized Rolls Built up by Chromium Plating. M. E. Gol'dshtein. *Henry Brutcher Translation No.* 3480, 5 p. (Slightly condensed from *Stanki i Instrument,* v. 25, no. 5, 1954, p. 33-34.) Henry Brutcher, Altadena, Calif.

Technique for plating portions of rolls without a large rig or having to immerse the entire roll in a chromium plating bath, with resulting economies in equipment and electrolyte. Diagrams. (L17, T5, Cr)

369-L. (Russian.) **Influence of the Curvature of the Microprofile of a Surface on the Electrochemical Polishing of Metals.** S. I. Krichmar. *Doklady Akademii Nauk SSSR,* v. 101, no. 2, Mar. 11, 1955, p. 297-300.

Mathematical treatment; calculation of polishing time. Table, graph. 4 ref. (L13)

370-L. (Book.) **American Electroplaters' Society, Proceedings,** (Annual Volume), v. 41, 1954. 288 p. American Electroplaters' Society, 445 Broad, St., Newark 2, N. J.

Forty-five reports delivered at annual convention. Papers individually abstracted. (L17)

M

Metallography, Constitution and Primary Structures

146-M. Lattice Spacings of the Aluminium-Rich Solid Solution Containing Magnesium and Silicon. R. B. Hill and H. J. Axon. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 354-356.

Measurements show negative devi-

ation from simple additivity, the magnitude of which increases with increasing alloy content of the solid solution. Graph, table. 5 ref. (M26, Al)

147-M. A Universal Polishing Method. H. S. Cannon. *Metal Progress,* v. 67, Apr. 1955, p. 83-86.

Standard procedures for using two grades of high-purity alumina polishing powder. Micrographs. (M21)

148-M. Oxidation Method for Measuring True Austenitic Grain Size. (Digest of "Perfecting the Oxidation Method to Permit Showing the True Austenitic Grain of Steels", by A. Kohn; *Revue de Metallurgie,* v. 57, Feb. 1954, p. 129-137.) *Metal Progress,* v. 67, Apr. 1955, p. 158, 160, 162.

Previously abstracted from original. See item 188-M, 1954. (M27, ST)

149-M. (German.) **The Aluminum-Silicon System.** H. Spengler. *Metall,* v. 9, nos. 5-6, Mar. 1955, p. 181-186.

Solubility of aluminum in silicon in the solid state; microstructure of eutectic aluminum-silicon alloy. Micrographs, graphs, table. 41 ref. (M27, M24, N12, Al, Si)

150-M. (German.) **The Principles of the Iron-Carbon Diagram.** P. Steidl. *Schweissen und Schneiden,* v. 7, no. 2, Feb. 1955, p. 61-66.

Structure of metals; the iron-carbon space-lattice; determination of constitution diagrams and their significance; effect of alloying elements. Diagrams, graphs, micrographs. 4 ref. (M24, Fe)

151-M. (German.) **Recent Developments on Apparatus to Prepare Polished Micro-Sections and for Metallographic Examination.** Richard Pusch. *Stahl und Eisen,* v. 75, no. 6, Mar. 24, 1955, p. 335-345.

Specimen preparation, methods of illumination, optical equipment and technique of obtaining photomicrographs. Photographs, micrographs, table, diagrams. 52 ref. (M21)

152-M. The Electron Microscope and Some of Its Industrial Applications. *Machinery (London),* v. 86, Apr. 15, 1955, p. 805-812.

Uses of the microscope in connection with metallurgical investigations. Micrographs, photographs. (M21)

153-M. (English.) **Data on Copper Oxyarsenate, Copper Nickeloxyarsenate, and Nickel Oxide Inclusions.** Z. Hegedüs. *Acta Technica Academiae Scientiarum Hungaricae,* v. 10, nos. 1-2, 1955, p. 117-126.

Optical and physical behavior; formation of nickel oxide inclusions and their distinction from other nonmetallic inclusions in copper. Micrographs, table. 5 ref. (M28, Cu, Ni)

154-M. (Dutch.) **Technique of Preparations for Metal Investigations.** W. G. R. de Jager and P. Breedveld. *Metalen,* v. 10, no. 5, Mar. 15, 1955, p. 61-65 + 6 plates.

Review of metallographic procedures. Micrographs, table. 3 ref. (M21)

155-M. (German.) **Data on Copper Oxide Inclusions in Industrial Copper.** Z. Hegedüs. *Acta Technica Academiae Scientiarum Hungaricae,* v. 10, nos. 1-2, 1955, p. 127-137.

Optical behavior and identifying characteristics; technological defects caused by the inclusion; reactions occurring during hot working. Micrographs. 3 ref. (M27, Cu)

156-M. (German.) **Process of Etching Highly Alloyed Chromium and Chromium-Nickel Steels for Revealing Austenite, Ferrite, Sigma Phase, and Carbides.** Franz Braumann and Günther Pier. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 145-151.

Effect of several etchants on above phases; selective electrochemical etching of austenite-ferrite structure. Tables, micrographs, graphs, diagram. 10 ref. (M21, AY)

157-M. (German.) **Experiences With Counting-Tube Equipment for X-Ray Microstructure Investigations and Spectrum-Emission Analysis.** Hermann Möller and Viktor Hauk. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 171-178.

Comparison of Debye-Scherrer recordings on X-ray film with counting-tube goniometer recordings; accuracy of glancing-angle determination; limit of detecting admixtures; comparison with chemical analyses of steels and iron-copper mixtures. Tables, graphs, X-ray recordings, micrographs. 18 ref. (M22, S11, Fe, Cu, ST)

158-M. (German.) **Chromium Alloys With Platinum, Iridium, Rhodium, and Ruthenium.** Ernst Raub and Werner Mahler. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 210-215.

X-ray and microscopic investigation of alloy formation. Crystal structure and physical properties. Tables, graphs, micrographs. 4 ref. (M24, P general, Cr, Pt, Ir, Rh, Ru)

159-M. (German.) **Crystal Chemistry of B-Metals. III. Crystal Structure of GaSe and InTe.** Konrad Schubert, Erhard Dörre and Manfred Kluge. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 216-224.

Thorough investigation on the basis of bibliographical information and experimental data. Tables, diagram. 18 ref. (M26, In, Te, Ga, Se)

160-M. (German.) **Influence of Different Etching Agents on Germanium. I. Chemical Action of Certain Etching Agents on Germanium. II. Physical Consideration.** Oskar Rösner and Gotthold Zielasek. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p 225-233.

Action of various liquids and gases investigated, microscopically and gravimetrically, in addition to the recovery possibilities of germanium from spent etching solutions. Diagrams, tables, micrographs. 7 ref. (M21, Ge)

161-M. (Swedish.) **Apparatus for Linear Microscopic Analysis.** G. Molinder. *Jernkontorets Annaler,* v. 139, no. 3, 1955, p. 174-181.

Apparatus for use in the study of amount of different constituents of steel, carbon content of austenite etc., after different heat treatments. Photograph, tables, graphs. 7 ref. (M21)

162-M. Electrolytic Etching. Cornelius A. Johnson. *AB Metal Digest,* v. 1, Mar. 1955, p. 3-5, 9.

An indispensable tool in many routine studies of microstructures, as well as research-type problems involving the development of specialized techniques. Graphs, photographs, diagrams, micrographs. (M21)

163-M. Surface Examination by Reflection Electron Microscopy. J. S. Halliday. *Engineer,* v. 199, Apr. 22, 1955, p. 569-573.

Advantages of reflection electron microscopy over other methods of surface examination. Micrographs, diagrams, table. (M21)

164-M. The System Uranium-Tungsten. D. Summers-Smith. *Institute of Metals, Journal,* v. 83, Apr. 1955, p. 383-384.

Solubility of uranium in tungsten and that of tungsten in uranium were investigated in arc-melted alloys by X-rays, dilatometry and metallography. Tables. 6 ref. (M24, N12, U, W)

165-M. (English.) **Dislocation Networks in Crystals.** Taira Suzuki and Hideji Suzuki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 573-596.

Space arrangements of networks have certain intimate connection with their persistence in crystals. Diagrams, graphs, table. 40 ref. (M26)

166-M. (Book.) **Applied X-Rays.** George L. Clark. International Series in Pure and Applied Physics. 4th Ed. 843 p. 1955. McGraw-Hill Book Company, New York, N. Y. $12.50.

General physics and applications of X-radiation. X-ray analysis of the ultimate structures of materials. (M22, S11)

167-M. (Book.) **X-Ray Diffraction by Polycrystalline Materials.** H. S. Peiser, H. P. Rooksby, and A. J. C. Wilson, editors. Physics in Industry Series. 725 p. 1955. Institute of Physics, 47 Belgrave Square, London, S.W. 1, England. 63s.

Experimental techniques, interpretation of data, and practical uses of techniques in different fields. (M22)

N

Transformations and Resulting Structures

184-N. Some Observations on Isothermal Transformations of Eutectoid Aluminum Bronzes Below Their M_s Temperatures. R. Haynes. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 357-358 + 3 plates.

Microstructural changes occurring during transformations. It is suggested that isothermal formation of martensite occurs and that both martensite and the phase from which it forms may transform to eutectoid. Table, micrographs. 5 ref. (N9, Cu-d)

185-N. The Mechanism of the Irradiation Disordering of Alloys. G. H. Kinchin and R. S. Pease. *Journal of Nuclear Energy,* v. 1, Feb. 1955, p. 200-202.

Calculations suggesting possible mechanism responsible for the rapid disordering produced in ordered alloys. 6 ref. (N10)

186-N. Radioactive-Tracer Diffusion Studies. (Digest of "The Diffusion of Iron in Nickel", by M. B. Neiman, A. Ya. Shinyaev and B. G. Dzantiev; *Doklady Akademii Nauk SSSR,* v. 91, 1953, p. 265-267.) *Metal Progress,* v. 67, Apr. 1955, p. 196.

Previously abstracted from original. See item N-26, 1954. (N1, Fe, Ni)

187-N. Process of Formation of Sigma Phase in 18% Cr, 10% Ni, 2% Mo Steel. F. Braumann and H. Krächter. *Henry Brutcher Translation No.* 3447, 20 p. (From *Archiv für das Eisenhüttenwesen,* v. 25, nos. 9-10, 1954, p. 479-488.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 41-N, 1955. (N6, SS)

188-N. Formation of Graphite on the Surface of Steel During Heat Treating in Vacuum. E. Z. Graifer and I. V. Salli. *Henry Brutcher Translation No.* 3469, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 97, no. 4, 1954, p. 663-665.) Henry Brutcher, Altadena, Calif.

Previously abstracted from origi-

nal. See item 430-N, 1954.
(N8, Fe, ST)

189-N. (English.) **On the Precipitation Process in Aluminium-Zinc-Magnesium Alloys. I. Al-$Al_2Zn_3Mg_3$ System.** Ken-ichi Hirano and Yutaka Takagi. *Physical Society of Japan, Journal,* v. 10, no. 3, Mar. 1955, p. 187-192.

Existence of two separate processes was confirmed. Graphs. 12 ref. (N7, Al, Zn, Mg)

190-N. (English.) **Precipitation From Solid Solution of Lead in Magnesium.** Ken-ichi Hirano, Hideyo Maniwa, and Yutaka Takagi. *Physical Society of Japan, Journal,* v. 10, no. 3, Mar. 1955, p. 193-197.

Results reveal that aging process is constituted from two discrete reactions. Graphs. 17 ref.
(N7, Pb, Mg)

191-N. (French.) **Dilatometric Study of the Alpha ⇌ Sigma Transformation in Iron-Chromium Alloys.** Paul Bastien and Gilles Pomey. *Comptes rendus,* v. 240, no. 8, Feb. 21, 1955, p. 866-868.

An expansion-temperature diagram of various metastable states established, making it possible to interpret expansion curves encountered in practice. Graphs.
(N6, Fe, Cr)

192-N. (German.) **The Process of Flame-Hardening, Represented in the Time-Temperature Transformation Diagram for Continuous Cooling.** Adolf Rose and Leo Rademacher. *Stahl und Eisen,* v. 75, no. 4, Feb. 24, 1955, p. 199-210.

Effect of type and performance of torch and rate of feed on the temperature distribution, process of cooling and hardness penetration. Diagrams, graphs, micrographs. 8 ref. (N8, J2, AY)

193-N. (Russian.) **Diffusion of Antimony and Tin in a Semiconductor Alloy SbZn.** B. I. Boltaks. *Doklady Akademii Nauk SSSR,* v. 100, no. 5, Feb. 11, 1955, p. 901-903.

Temperature relation to diffusion coefficient. Graph. 8 ref.
(N1, Sb, Zn)

194-N. **Grains Within Grains.** R. C. Gifkins. *Australasian Engineer,* 1955, Feb., p. 41-49.

History of discovery of various types of subgrains, development of theories and origin traced. X-ray pattern, diagrams, micrographs, photographs. 6 ref. (N2)

195-N. **The Solution of Gases in Liquid and Solid Metals.** A. E. Jenkins. *Australasian Engineer,* 1955, Feb., p. 51-60.

Investigations concerning solubility of gases in metals summarized. Tables, graphs. 65 ref. (N16)

196-N. **Ordering Processes in Cu_3Au.** Fred P. Burns and S. L. Quimby. *Physical Review,* v. 97, ser. 2, Mar. 15, 1955, p. 1567-1575.

Data which describe isothermal time rate of change of electrical resistivity in specimen following quench from temperature above the critical to one below it. Diagram, graphs. 21 ref. (N10, Cu)

197-N. (French.) **Segregation of Foreign Atoms in the Melted Grain Boundaries of High-Purity Aluminum.** Fréderic Montariol. *Comptes rendus,* v. 240, no. 10, Mar. 7, 1955, p. 1087-1089.

Effect of temperature on diffusion of impurities. Micrographs. 3 ref. (N1, Al)

198-N. (French.) **Displaying by Autoradiography the Simultaneous Migration of Grain Boundries and Dissolved Atoms in an Aluminum-Copper Alloy With 0.4% Copper at Temperatures Close to the Melting Point of the Alloy.** Maurice Robert, André Robillard and Paul Lacombe. *Comptes rendus,* v. 240, no. 10, Mar. 7, 1955, p. 1089-1091.

Studies on sheet specimens; diffusion-temperature relationships. Autoradiographs. (N1, Al)

199-N. (French.) **Influence of Impurities on the Polygonization of Aluminum.** Jean Montuelle and Georges Chaudron. *Comptes rendus,* v. 240, no. 11, Mar. 14, 1955, p. 1167-1168.

Study of recrystallization of aluminum of different purities. Micrograph. 2 ref. (N5, Al)

200-N. (French.) **Mechanism of Solidification and Segregations in Phosphorus Cast Irons.**. Michel Ferry, Garbrielle Aubrion and Jean-Claude Margerie. *Fonderie,* 1955, no. 109, Feb., p. 4353-4372 + 1 plate.

Detailed study of dendritic segregation in above alloys. Graphs, tables, micrographs. 24 ref. (N12, CI)

201-N. (French.) **Structure Modifications of the Metallic Crystal and Their Influence on the Kinetics of the Structural Hardening of Solid Solutions of Aluminum.** Aurel Berghezan. *Publications scientifiques et techniques du ministére de l'air,* no. 283, 1953, 95 p.

Influence of rate of quenching on hardening kinetics; relation between method of recrystallization prior to quenching and aging of solid solutions; effect of cold hardening immediately after quenching. Diagrams, graphs, micrographs. 88 ref. (N5, N7, J26, Al)

202-N. (French.) **A Radiographic Study of the Influence of Forging Upon the Dendritic Segregation of the Phosphorus in Steel Ingots.** A. Kohn and J. Doumerc. *Revue de métallurgie,* v. 52, no. 3, Mar. 1955, p. 249-257.

By use of the autoradiographic method it was possible to determine the influence of forging and long time annealing upon segregation of phosphorus in the metal. Micrographs, diagram, graph. 3 ref. (N12, F22, ST)

203-N. (German.) **Transformation Behavior and Impact Toughness of Case-Hardened Steels.** Helmut Krainer, Max Kroneis and Reinhold Gattringer. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 131-139; disc., p. 139-140.

TTT-diagrams of steels with different carbon content in hard surface layer; conditions for intermediate annealing for complete transformation of surface zone, transformation zone and core of unalloyed and alloyed steels; effect of hardness treatments on impact strength. Table, graphs, micrographs, diagram. 10 ref.
(N8, Q6, ST)

204-N. (German.) **Investigation of Transformation Processes and Segregation Phenomena in Nickel Steels With Magnetic Suspension.** Kurt Hans v. Klitzing and Elfriede Wesselhöft. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 141-144.

Magnetic inhomogeneities in steels revealed by orientation of magnetite particles in surface of metallographic specimens. Micrographs. 7 ref. (N general, M27, AY)

205-N. (German.) **Influence of the Degree of Deformation on the Diffusion Processes in Low-Alloy Copper-Tin-Phosphorus Alloy.** Guido Bassi and Bengt Ström. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 208-209.

Investigation on copper alloy with 0.3% tin and 0.2% phosphorus under different heat treatments. Diagram, micrographs. 3 ref. (N1, Q24, Cu)

206-N. (Russian.) **Use of Isotope C^{14} for the Study of the Diffusion of Carbon in Steel.** P. L. Gruzin, V. G. Kostogonov and P. A. Platonov. *Doklady Akademii Nauk SSSR,* v. 100, no. 6, Feb. 21, 1955, p. 1069-1072.

Test made in austenite and ferrite steels before and after tempering; temperature relation in gamma and alpha-iron. Graphs, tables. 9 ref.
(N1, ST)

207-N. (Russian.) **Problem of Diffusion of Arsenic in Steel.** D. S. Kazarnovskii. *Doklady Akademii Nauk SSSR,* v. 100, no. 6, Feb. 21, 1955, p. 1073-1075 + 1 plate.

Microstructure of steels with different arsenic content, after heat treatment; degree of striation. Micrographs, tables. 3 ref.
(N1, M27, ST, As)

208-N. (Russian.) **Certain Peculiarities of the Transformation of Austenite in the Martensitic and Intermediary Ranges.** M. G. Lozinskii. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1954, no. 11, Nov., p. 36-43 + 4 plates.

Apparatus for studying microstructure of metals and alloy during high-temperature heating, with direct microscopic observation. Micrographs, diagram, photograph. 9 ref.
(N8 N9, M21)

209-N. **On the Behavior of Rapidly Diffusing Acceptors in Germanium.** F. van der Maesen and J. A. Brenkman. *Electrochemical Society, Journal,* v. 102, May 1955, p. 229-234.

Studies of the acceptor activity of copper and nickel and their diffusion in germanium. Tables, graphs. 12 ref. (N1, P15, Ge)

210-N. **Some Observations on Isothermal Austenite Transformation Near the M_s Temperature.** O. Schaaber. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Apr. 1955, p. 559-560.

Observations made on number of low alloy steels by dilatometric and inductive measurement at various temperatures. Tables, graphs. 12 ref. (N8, ST)

211-N. **Stability of Inorganic Compounds in High Vacuum.** M. Auwärter. *Henry Brutcher Translation No.* 3425, 8 p. (From *Plansee (Austria) Proceedings,* 1952, p. 1-7.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 234-N, 1953. (N12)

212-N. (English.) **On the Order-Disorder Transformation of the Alloys of Iron and Cobalt.** Hakaru Masumoto, Hideo Saito and Masao Shinozaki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 523-528.

Data on measurement of specific heat of the phase alloys of the iron-cobalt system. Graphs, tables. 5 ref. (N10, Fe, Co)

213-N. (English.) **On the Primary Crystallization of the System Sn-Bi.** Tadashi Yanagihara and Rokuro Kawanishi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 557-564.

Viscosity change during the solidification of the alloy tin-bismuth was studied with the rotational viscosimeter. Diagrams, graphs, tables, micrographs. 3 ref. (N12, Sn, Bi)

214-N. (Russian.) **Growth of Spheroidal Inclusions of Graphite in Cast Irons.** K. P. Bunin, Iu. N. Taran and T. M. Shpak. *Doklady Akademii Nauk SSSR,* v. 101, no. 1, Mar. 1, 1955, p. 65-67.

Nature of phenomena in gray magnesium cast iron with solidification and tempering. Micrographs. 9 ref. (N12, CI)

215-N. (Russian.) **Solubility of Oxygen in Liquid Iron Which Contains Titanium.** B. K. Liaudis and A. M. Samarin. *Doklady Akademii Nauk SSSR,* v. 101, no. 2, Mar. 11, 1955, p. 325-326.

Two reaction formulas, on the basis of experimental data, are presented; one for titanium concentrations up to 0.04%, and the second for 0.04 to 0.5%. Table. (N12, Fe, Ti)

P

Physical Properties and Test Methods

150-P. Total Normal Emissivity Measurements on Aircraft Materials Between 100 and 800° F. N. W. Snyder, J. T. Gier and R. V. Dunkle. *American Society of Mechanical Engineers, Paper No.* 54—A-189, 1954, 14 p. + 3 plates.

Results of techniques developed and used to determine mean effective emissivity of different surfaces from 100 to 800° F. Diagrams, graphs. 7 ref. (P11)

151-P. Electrical Contact Materials. John D. Kleis. *Electrical Manufacturing,* v. 55, Apr. 1955, p. 102-107.

Mechanical and electrical properties of over 30 metals, alloys and oxides related to performance. Tables, photographs. (P15, Q general, T1, SG-r)

152-P. The Thermal Conductivity of Metals at Low Temperatures. H. M. Rosenberg. *Royal Society of London, Philosophical Transactions,* v. 247, ser. A, no. 933, Mar. 1955, p. 441-497.

Thermal conductivity of high-purity samples of 32 metals. Tables, diagrams, graphs. 58 ref. (P11)

153-P. (French.) **Discontinuities in the Thermo-Electric Properties of Thin Metallic Sheets.** Jean Savornin and France Savornin. *Comptes rendus,* v. 240, no. 8, Feb. 21, 1955, p. 850-852.

Thermo-electric power data of layers of aluminum, vaporized in a vacuum, followed by exposure to air. Graph. 1 ref. (P15, Al)

154-P. (French.) **Electromotive Force and Thermo-Electric Power of the Aluminum-Silver Couple.** André Aron. *Comptes rendus,* v. 240, no. 8, Feb. 21, 1955, p. 852-854.

Prepared by vaporization, in vacuo, of pure silver and pure aluminum, in relatively thick deposits, with an electric resistance near 1 Ω. Graph. 4 ref. (P15, Ag, Al)

155-P. (Russian.) **Influence of the Holes (Vacancies) in the Crystal Lattice on the Electrical Resistance of a Metal.** B. G. Lazarev and O. N. Ovcharenko. *Doklady Akademii Nauk SSSR,* v. 100, no. 5, Feb. 11, 1955, p. 875-878.

Mathematical treatment. Increase of residual resistance with increase of heating temperature before quenching. Graphs. 11 ref. (P15, Au, Pt)

156-P. The Vapor Pressure of Americium Metal. Stephen C. Carniglia and B. B. Cunningham. *American Chemical Society, Journal,* v. 77, Mar. 20, 1955, p. 1502.

Determined between 1103 and 1453° C. 5 ref. (P12, Am)

157-P. Electrical Properties of Gallium Antimonide. D. P. Detwiler. *Physical Review,* v. 97, ser. 2, Mar. 15, 1955, p. 1575-1578.

Data on conductivity and Hall coefficient of several samples. Graphs. 7 ref. (P15, Ga, Sb)

158-P. Superconductivity of Uranium. John L. Kilpatrick, Edward F. Hammel and Dillon Mapother. *Physical Review,* v. 97, ser. 2, Mar. 15, 1955, p. 1634-1635.

Various samples of uranium become superconductors at various temperatures; reasons for this behavior are still somewhat obscure. 4 ref. (P15, U)

159-P. Preliminary Experiments on the Temperature-Wave Method of Measuring Specific Heats of Metals at Low Temperatures. D. H. Howling, E. Mendoza and J. E. Zimmerman. *Royal Society, Proceedings,* v. 229, ser. A, Apr. 5, 1955, p. 86-109.

Reliable results can be obtained in the helium range, using apparatus and procedures which are not too complicated. It seems reasonable that the method will still be useful at temperatures below 1°K. Diagrams, graphs. 17 ref. (P12)

160-P. (German.) **Electric Conductivity of Cadmium Selenide.** K. Hauffe and H. G. Flint. *Annalen der Physik,* v. 15, nos. 3-4, 1955, p. 141-147.

Measurements between 300 and 500° C. Diagrams, tables. 12 ref. (P15, Cd, Se)

161-P. (German.) **Determining the Melting Range of Several Commercial Ferro-Alloys.** Hans. Brendecke and Franz Pawlek. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 125-126.

Melting temperature determinations on eight types. Table, diagram. 3 ref. (P12, Fe-n)

162-P. (German.) **Ferromagnetic Properties of Transition Metal Alloys With Elements of the B-Group.** Lotte Castelliz. *Zeitschrift für Metallkunde,* v. 46, no. 3, Mar. 1955, p. 198-203.

Investigation of binary and ternary systems. Relation between crystal structure and ferromagnetic properties. Tables, diagrams. 12 ref. (P16, M24)

163-P. (Russian.) **Electrode Potentials of Metals in Fused Salts.** Iu. K. Delimarskii. *Zhurnal Fizicheskoi Khimii,* v. 29, no. 1, Jan. 1955, p. 28-38.

Decomposition potentials at 700° C.; electrochemical charges; anion effects. Tables. 40 ref. (P15)

164-P. (Russian.) **Thermo-Electric Properties of Alloys of the Bismuth-Tellurium System.** F. I. Vasenin. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 3, Mar. 1955, p. 397-401.

Data on properties of cast, pressed and tempered specimens. Table, graphs. 4 ref. (P15, Bi, Te)

165-P. Specific-Heat Measurements on Aluminium-4% Copper and Aluminium-4% Copper-Tin Alloys. I. J. Polmear and H. K. Hardy. *Institute of Metals, Journal,* v. 83, Apr. 1955, p. 393-394.

Measurements of instantaneous apparent specific heat of aluminum-copper and aluminum-copper-tin alloys, on heating, showed a heat evolution due to precipitation which, on further raising the temperature, was replaced by a heat absorption due to re-solution. Graphs. 7 ref. (P12, Al)

166-P. Thermoelectric Power and Electrical Resistivity of Dilute Alloys of Silicon in Copper, Nickel, and Iron. C. A. Domenicali and F. A. Otter. *Journal of Applied Physics,* v. 26, Apr. 1955, p. 377-380.

Determines effects on thermopower of the neighboring elements, iron, nickel and copper, when varying amounts of the same foreign atom are dissolved in them. Graphs. 11 ref. (P15, Si, Cu, Ni, Fe)

167-P. Orientation and Temperature Effects on the Electrical Resistivity of High-Purity Magnesium. James L. Nichols. *Journal of Applied Physics,* v. 26, Apr. 1955, p. 470-472.

Additional insight into electrical resistivity in terms of improvement of metal purity and verification of existing data on the effect of crystal orientation and temperature on electrical properties of magnesium. Graphs, tables. 6 ref. (P15, Mg)

168-P. Study of the Radiation Stability of Austenitic Type 347 Stainless Steel. M. B. Reynolds, J. R. Low, Jr., and L. O. Sullivan. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Apr. 1955, p. 555-559.

Effect of neutron bombardment on the stability of Type 347 investigated by a magnetic technique. Graphs, diagram, table. 3 ref. (P10, SS)

169-P. A Thermodynamic Study of Liquid Metallic Solutions. VI. Calorimetric Investigation of the Systems Bismuth-Lead, Cadmium-Lead, Cadmium-Tin and Tin-Zinc. O. J. Kleppa. *Journal of Physical Chemistry,* v. 59, Apr. 1955, p. 354-361.

High-temperature calorimeter determines heats of mixing for the systems. Tables, graphs. 12 ref. (P12, Bi, Cd, Pb, Sn, Zn)

170-P. (English.) **Some Investigation on the Electrical Properties of Hexagonal Selenium.** L. M. Nijland. *Philips Research Reports,* v. 9, Aug. 1954, p. 259-294.

Effects of small amounts of impurities, such as halogens or thallium, on semiconducting properties. Graphs, diagrams, table, micrograph. 37 ref. (P15, Se)

171-P. (English.) **Magnetic Hysteresis in Annealed Nickel-Cobalt Alloys.** Mikio Yamamoto, Satoshi Taniguchi and Kinji Hoshi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 539-550.

Abnormal hysteresis loops may be explained by the occurrence of an additional uni-axial anisotropy along the direction of magnetization vectors during annealing. Table, graphs. 20 ref. (P16, Ni, Co)

172-P. (English.) **Influence of Addition of Nickel on the Thermal Expansion, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Cobalt, Iron and Chromium, Especially of Co-Elinvar. I. Additions of 10 and 20 Per Cent of Nickel.** Hakaru Masumoto, Hideo Saito and Tatsuo Kono. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 529-538.

Results of study on the influence of addition of nickel on the physical properties of the alloys of cobalt, iron and chromium. Tables, graphs. 5 ref. (P11, Q21, Co, Fe, Cr, NiO)

Q

Mechanical Properties and Test Methods; Deformation

472-Q. Elastic Constants of Aluminum From 20° C to 400° C. Charles Zucker. *Acoustical Society of America, Journal,* v. 27, Mar. 1955, p. 318-320.

Use of ultrasonic pulse technique as means of determining elastic constants of polycrystalline aluminum. Diagram, graphs. 10 ref. (Q21, Al)

473-Q. Plastic Strain and Stress Relations at High Temperatures. II. A. E. Johnson, N. E. Frost and J. Henderson. *Engineer,* v. 199, Mar. 25, 1955, p. 403-405.

Short-time combined stress properties of carbon steel and aluminum alloys. Graphs. 1 ref. (To be continued.) (Q27, Al, CN)

474-Q. A Hot Impact Tensile Test and Its Relation to Hot-Working Properties. E. A. Leech, P. Gregory and R. Eborall. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 347-353.

Simple, rapid laboratory test which can be used to assess the hot workability of materials. Diagrams, tables, graphs. 4 ref. (Q27, Q6)

475-Q. The Metallographic Detection of Deformation in Copper and Alpha-Brasses. L. E. Samuels. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 359-368 + 4 plates.

Survey of a wide range of etching techniques in detecting evidence of deformation. Tables, micrographs, graphs. 40 ref. (Q24, M21)

476-Q. How Chromium Steels Rate for High-Temperature Aircraft Service. II. E. A. Loria. *Iron Age,* v. 175, Apr. 14, 1955, p. 103-106.

Excellent properties allow them to be used to advantage in many applications. Graphs, tables. 4 ref. (Q general, T24, AY)

477-Q. How Stainless Steels Rate for High Temperature Aircraft Service. I. E. A. Loria. *Iron Age,* v. 175, Apr. 7, 1955, p. 119-122.

Comparison of mechanical properties of ferritic and austenitic grades. Tables, graphs. 3 ref. (To be continued.) (Q general, T24, SS)

478-Q. The Effect of Alpha-Particle Bombardment on the Creep of Cadmium Single Crystals. M. J. Makin. *Journal of Nuclear Energy,* v. 1, Feb. 1955, p. 181-193.

No significant change in creep rate was detected, although experiments were made on crystals differing in purity, surface condition and orientation. Tables, diagram, graphs. 17 ref. (Q3, Cd)

479-Q. Better Steel Castings for High-Temperature Plant. W. Siegfried and F. Eisermann. *Metal Progress,* v. 67, Apr. 1955, p. 100-101.

Effects of minor amounts of vanadium, nickel and copper on stress-rupture of smooth and notched specimens. Graphs, table. (Q4, Ni, Cu, V, CN)

480-Q. The Geometrical Size Effect in Notch Brittle Fracture. A. A. Wells. *North East Coast Institution of Engineers & Shipbuilders, Transactions,* v. 71, Apr. 1955, p. 277-290.

Discussed in the light of metallurgical and geometrical variables. Tables, graphs. 17 ref. (Q26)

481-Q. The Plastic Indentation of a Layer by a Flat Punch. R. T. Shield. *Quarterly of Applied Mathematics,* v. 13, Apr. 1955, p. 27-46.

Upper and lower bounds for average pressure in the indentation obtained by application of the limit-design theorems. Diagrams, graphs. 7 ref. (Q23)

482-Q. The Effect of Microstructure on the Morphology of Fracture. I. J. C. Danko and R. D. Stout. *Welding Journal,* v. 34, Mar. 1955, p. 113S-116S.

Investigates effect of pearlitic microstructures in the morphology of fracture and a theoretical explanation on the deformation behavior of pearlite. Table, graph, micrographs. 11 ref. (Q26, M27, ST)

483-Q. The Effect of Microstructure on Notch Toughness. II. John H. Gross and Robert D. Stout. *Welding Journal,* v. 34, Mar. 1955, p. 117S-122S.

Variables affecting notch toughness of unhardened plain carbon steels. Tables, diagram, graphs, micrographs. 5 ref. (Q23, M27, CN)

484-Q. Temper Brittleness of Pressure Vessel Steels. Leonard D. Jaffe. *Welding Journal,* v. 34, Mar. 1955, p. 141S-150S; disc., p. 151S-152S.

Nature of the phenomenon, its manifestation and how it may be prevented. Graphs, photographs, micrographs, tables. 177 ref. (Q23, CN, AY)

485-Q. Fatigue of Spot Welds. Georges Welter. *Welding Journal,* v. 34, Mar. 1955, p. 153S-156S.

Review of reports relating to fatigue resistance of untreated and hydrostatically treated spot welds and its chronological development during the last 10 years. 10 ref. (Q7, K3)

486-Q. Energy Criteria of Fracture. E. Orowan. *Welding Journal,* v. 34, Mar. 1955, p. 157S-160S.

Modifications of Griffith theory presented to cover the case for a rapidly running crack and for starting up a stationary crack. Diagrams. 8 ref. (Q26)

487-Q. Residual Stresses Set Up by Flame Hardening. H. Bühler. *Henry Brutcher Translation No.* 3465, 10 p. (Abridged from *Archiv für das Eisenhüttenwesen,* v. 25, nos. 3-4, 1954, p. 153-158.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 508-Q, 1954. (Q25, J1, J2, ST)

488-Q. (English.) **A New Method for the Statistical Treatment of Fatigue Data.** Waloddi Weibull. *SAAB Aircraft Company, Technical Notes, SAAB TN* 30, 1954, 19 p.

New life scale for representation of S-N curves for estimating scatter of fatigue strength as a function of fatigue life. Tables, graphs. 7 ref. (Q7)

489-Q. (English.) **The Static Strength and the Fatigue Strength of Riveted, Spotwelded, and Redux-Bonded Joints in 24S-T Aluminum Alloy Sheet.** Waloddi Weibull. *SAAB Aircraft Company, Technical Notes, SAAB TN* 31, 1954, 12 p.

Ultimate tensile strengths and fatigue lifetimes of five different joints determined and compared with corresponding values of plain specimens taken from the same sheet. Tables, diagrams, graphs. (Q23, Q7, Al)

490-Q. (English.) **The Propagation of Fatigue Cracks in Light-Alloy Plates.** Waloddi Weibull. *SAAB Aircraft Company, Technical Notes, SAAB TN* 25, 1954, 20 p.

Observations on aluminum and magnesium alloys. Tables, diagrams, graphs. (Q7, Al, Mg)

491-Q. (German.) **Effect of High-Temperature Annealing of Ingots on Structure Formation and Properties of Aluminum-Manganese Alloys (Aluman).** H. Hug. *Metall,* v. 9, nos. 5-6, Mar. 1955, p. 176-180.

Effect of heat treating temperature and time on the rolling properties of continuously cast ingots and on the mechanical properties of the rolled sheets. Graphs, table, micrographs. (Q general, J23, F23, Al)

492-Q. (German.) **Steep Decline of the Curve of Notched Bar Toughness and Appearance of Fracture of the Notched Bars With Heavy Plates Made of Soft Steels.** Heinz Kornfeld. *Stahl und Eisen,* v. 75, no. 5, Mar. 10, 1955, p. 265-278.

Relations between impact energy absorbed and occurrence of brittle fractures. Graphs, tables, photographs. 7 ref. (Q26, Q6, CN)

493-Q. (Polish.) **Statistical Relation of Q_r to R_r in Heat Treated Steel TR2.** Zygmunt Jasiewicz. *Hutnik,* v. 21, no. 8, Aug. 1954, p. 249-255.

Frequency-distribution curves of strength determinations on specimens of a low alloy steel. Graphs, tables. (Q23, AY)

494-Q. (Russian.) **Investigation of Wear Resistance of Sulfided Cutters Made of High-Speed Steel.** E. P. Nadeinskaia. *Stanki i Instrument,* v. 26, no. 2, Feb. 1955, p. 11-17.

Comparisons made of wear on cutters with those normally heat treated, in relation to speed and time of cutting. Tables, graphs. (Q9, L15, TS)

495-Q. Beams of Metal or Wood Subjected to Millions of Reversals of Compression and Tension ($Sigma_c$ = $-Sigma_t$) or to Longtime Steady Compression Longitudinally. Arthur Buchwald Lamberg. *Franklin Institute, Journal,* v. 259, Apr. 1955, p. 335-344.

Formulas produce dynamic endurance limits which may be used also as static endurance limits. (Q25, Q7)

496-Q. The Stresses in an Aeolotropic Circular Disk. H. F. Cleaves. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 8, Mar. 1955, p. 59-80.

Comprehensive treatment of the generalized plane stress problem under the most general edge loading. Tables, graphs. 7 ref. (Q25)

497-Q. Impact Buckling of Deep Beams in Pure Bending. J. F. Davidson. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 8, Mar. 1955, p. 81-87.

Behavior of a slender beam, having slight initial curvature and twist, and bent by impulsive moments of a type tending to produce lateral instability. Graphs, diagram, table. 5 ref. (Q5)

498-Q. Finite Deformation of Materials Exhibiting Curvilinear Aeolotropy. J. E. Adkins. *Royal Society, Proceedings,* v. 229, ser. A, Apr. 5, 1955, p. 119-134.

Theory is formulated for materials which are completely unsymmetrical, orthotropic or transversely isotropic with respect to the curvilinear co-ordinate system which is employed to define the aeolotropy. 10 ref. (Q21, Q24)

499-Q. A Resistance-Wire Grid System. Desi D. Vasarhelyi. *Trend in Engineering, (University of Washington),* v. 7, Apr. 1955, p. 4-9, 14.

A valuable method in solving the problem of mapping deformations without any interruption of the main testing process. Photographs, diagram. 4 ref. (Q25, Q24)

500-Q. (French.) **Enlargement of Rays of Debye-Scherrer Diagrams During the Plastic Deformation of Metallic Crystals.** Aurel Berghezan and Jean Hérenguel. *Comptes rendus,* v. 240, no. 12, Mar. 21, 1955, p. 1343-1345.

Describes study on five, regular 99.5% pure aluminum flakes, subjected to gradual oxidation. Diagrams. 2 ref. (Q24, Al)

501-Q. (French.) **Magnetic Measurements in Tensile Tests.** P. E. Lagasse. *Revue de métallurgie,* v. 52, no. 1, Jan. 1955, p. 28-32; disc., p. 32.

Method used to study structure changes in metals due to cold working and strain aging. Diagram, graphs, photograph. (Q27, P16)

502-Q. (French.) **The Use of Steels Subjected to Triaxial Stresses at High Temperature.** W. Siegfried. *Revue de métallurgie,* v. 52, no. 3, Mar. 1955, p. 201-218.

Study of creep resistance of various shapes of gears and turbine blades. Graphs, photographs, diagrams, tables. 4 ref. (Q3, AY)

503-Q. (French.) **Correlation Between the Structure and the Mechanical Properties of Gray Cast Irons.** Albert de Sy. *Schweizer Archiv für*

angewandte Wissenschaft und Technik, v. 21, no. 3, Mar. 1955, p. 76-80.
Study of tensile strength as a criterion of quality and the influence of shape, dimensions, quantity and distribution of graphite. Diagrams, micrographs.
(Q23, M27, CI)

504-Q. (German.) **Formation of Preferred Magnetic Orientations by Inhomogeneous Stresses on Magnetostriction Materials.** Eduard Houdremont and Otto Rüdiger. *Archiv für das Eisenhüttenwesen,* v. 26, no. 3, Mar. 1955, p. 153-157.
Effect of inhomogeneous stresses due to cold rolling, surface working, bending and embossing of grooves; detection of preferred orientation by magnetite-powder configurations. Diagrams, graphs, tables, micrographs. 18 ref. (Q24)

505-Q. (Italian.) **Properties of High Tin Content Aluminum-Tin-Copper Friction Alloys.** N. Collari and L. Paglialunga. *Alluminio,* v. 24, no. 1, Jan. 1955, p. 29-33.
Heat and mechanical treatments required to realize the best integration of the alloying element. Graphs, tables, micrographs. 7 ref.
(Q9, Sn, Cu, Al)

506-Q. (Italian.) **Creep Tests With Variations of Load at Constant Temperature.** A. Erra. *Metallurgia italiana,* v. 47, no. 2, Feb. 1955, p. 53-60, 61-62.
Series of creep tests on a chromium-molybdenum steel having a high creep limit, conducted at 500° C., with various types of load variations after 160 hr. Graphs, tables. 15 ref. (Q3, Cr, Mo)

507-Q. (Japanese.) **Weldable High Tensile Strength Steels.** Fukuji Ogino. *Metals (Japanese),* v. 25, no. 2, Feb. 1955, p. 85-87.
Studies of notch impact and other strength characteristics, at various temperatures, etc. Graphs, micrographs, tables. (Q23, Q6, AY)

508-Q. (Russian.) **Effect of the Melting Methods on the Properties of High Speed Steel.** Kim Den Son and A. M. Samarin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1954, no. 11, Nov., p. 27-35.
Use of concentrates of tungstate ores; effect of tungstite on manganese content. Increased manganese content and heat treatment required. Tables, graphs. 3 ref.
(Q general, TS)

509-Q. (Russian.) **Plastic Deformation of Steel Under Complex Stressing.** A. M. Zhukov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1954, no. 11, Nov., p. 53-61.
Polyaxial stress-strain relations; divergence of experimental and theoretical results. Tables, graphs, photograph. 5 ref. (Q24, ST)

510-Q. (Russian.) **Residual Stresses in Surface Layers of Metals, and Wear Resistance.** P. E. D'iachenko and T. V. Smushkova. *Vestnik Mashinostroeniia,* v. 35, no. 3, Mar. 1955, p. 38-40.
Influence of residual stress, caused by cold working or machining, on the wear resistance of different steels and cast irons. Graphs. 1 ref.
(Q9, Q25, ST, CI)

511-Q. (Russian.) **Effect of Surface-Active Substances on Mechanical Properties of Electrolytic Deposits of Copper.** Iu. S. Tsareva, V. G. Solokhina, N. T. Kudriavtsev and A. T. Vagramian. *Zhurnal Fizicheskoi Khimii,* v. 29, no. 1, Jan. 1955, p. 166-173.
Comparison of results with organic additions and with pure electrolytes. Graphs, diagram, table. 9 ref. (Q general, L17, Cu)

512-Q. (Russian.) **Analysis of the Stressed State in Large Plastic Deformations During the Stretching of Cylindrical Test Pieces With Annular Grooves.** A. N. Grubin and Iu. I. Likhachev. *Zhurnal Tekhnicheskoi Fiziki,* v. 25, no. 3, Mar. 1955, p. 512-528.
Physical relations between stresses and strains; boundary and contour conditions; data for stress and strain components in plastic range. Diagrams, graphs. 7 ref. (Q24)

513-Q. (Swedish.) **The Nominal Cleavage Strength of Steel.** Tore Norén. *Jernkontorets Annaler,* v. 139, no. 3, 1955, p. 141-153.
Determination by exposing test pieces with weld-deposited brittle surface layers to increasing tensile strength. Diagram, photographs, graphs, table. (Q26, L24, ST)

514-Q. (Swedish.) **The Fracture Mechanism of Steels Intended for Welding.** Cyrill Schaub. *Jernkontorets Annaler,* v. 139, no. 3, 1955, p. 154-173.
Criterion of brittleness transition range of steel. Tables, graphs, diagrams, photographs, micrographs. 12 ref. (Q23, Q26, K general, ST)

515-Q. (Swedish.) **The Creep of Metals.** Erik Nygren. *Jernkontorets Annaler,* v. 139, no. 3, 1955, p. 182-204.
Literature survey regarding the creep of metals. Graphs. 31 ref. (Q3)

516-Q. **A Large-Deflection Theory for Thin Plates.** E. H. Mansfield and P. W. Kleeman. *Aircraft Engineering,* v. 27, Apr. 1955, p. 102-108.
Theory based on assumption of an inextensional middle surface of the plate. Diagrams, graphs, photograph. 6 ref. (Q23)

517-Q. **Energy Theorems and Structural Analysis. I. General Theory.** J. H. Argyris. *Aircraft Engineering,* v. 27, Apr. 1955, p. 125-128, 129-134.
Application on energy principles of structural analysis including effects of temperature and nonlinear stress-strain relations. Diagrams, tables. 7 ref. (To be continued) (Q25)

518-Q. **The Selection and Treatment of High Speed Steels.** W. Sorby. *Alloy Metals Review,* v. 8, Mar. 1955, 9 p.
Tungsten, chromium, molybdenum, vanadium and cobalt, in various combinations, are used to develop abrasion resistance and high hardness characteristics at elevated temperatures. Tables, graphs, micrograph, diagram.
(Q29, Q9, J general, TS)

519-Q. **The Determination of Residual Stresses in Hardened, Ground Steel.** L. V. Colwell, M. J. Sinnott and J. C. Tobin. *American Society of Mechanical Engineers, Paper No.* 54—A-52. 1955, 12 p.
Residual surface stresses, induced by grinding a hardened SAE 4340 steel, investigated by means of X-ray diffraction and optical interferometric methods. Tables, graphs, diagram. 8 ref. (Q25, G17, AY)

520-Q. **Frictional Characteristics and Surface Damage of Thirty-Nine Different Elemental Metals in Sliding Contact With Iron.** Carl L. Goodzeit, Arvid E. Roach, and Richard P. Hunnicutt. *American Society of Mechanical Engineers, Paper* No. 54—A-53, 1955, 10 p.
Surface-damage characteristics related to the relative hardness of the metals in sliding contact, their mutual solubility and their ability to form intermetallic compounds. Tables, diagram, photographs, micrographs. 11 ref. (Q9, Fe)

521-Q. **Residual Grinding Stresses in Hardened Steel.** H. R. Letner. *American Society of Mechanical Engineers, Paper* No. 54—A-56, 1955, 12 p.
Residual stresses resulting from surface grinding a hardened ball-bearing-type steel, under closely controlled conditions, measured by deflection method. Effects of wheel grade, unit downfeed and grinding fluid upon the stresses generated. Graphs, photographs, table, diagram. 6 ref. (Q25, G17, AY)

522-Q. **Scoring Characteristics of Thirty-Eight Different Elemental Metals on High-Speed Sliding Contact With Steel.** A. E. Roach, C. L. Goodzeit and R. P. Hunnicutt. *American Society of Mechanical Engineers, Paper No.* 54—A-61, 1955, 14 p.
Metals that have the best score resistance against steel are the B-subgroup metals which are either insoluble with iron or else form intermetallic compounds with iron. Tables, graphs, photographs, diagram. 18 ref. (Q9, ST)

523-Q. **Effect of Sequence on the Coefficient of Friction in Cold-Drawing Low-Carbon Steel and 2S-O Aluminum Rods. III.** H. Majors, Jr. *American Society of Mechanical Engineers, Paper No.* 54—A-114, 1955, 13 p.
Average coefficients of drawing friction determined by Sachs theory and direct measurement, using SR-4 wire strain gages on the outer surface of the die. Die profiles determined by plastic castings. Tables, diagrams, graphs, photograph. 18 ref. (Q9, Q25, Al, CN)

524-Q. **Stresses and Strains in Cold-Extruding 2S-O Aluminum.** Erich G. Thomsen and Joseph Frisch. *American Society of Mechanical Engineers, Paper No.* 54—A-161, 1955, 20 p.
Steady-state particle-velocity vectors determined from gridded, split billets during incremental extrusion steps. Photographs, diagrams, graphs. 8 ref. (Q25, F25, Al)

525-Q. **A Method of Predicting the Effects of Notches in Uniaxial Fatigue.** William E. Dirkes. *American Society of Mechanical Engineers, Paper No.* 54—A-180, 1955, 9 p.
Correlates notches and unnotched test data by semigraphical method of extrapolating notched test results. Graphs. 9 ref. (Q7)

526-Q. **Biaxial Plastic Stress-Strain Relations of a Mild Steel for Variable Stress Ratios.** Joseph Marin and Ling-Wen Hu. *American Society of Mechanical Engineers, Paper No.* 54—A-243, 1955, 11 p.
Experimental checks on validity of simple flow theory of plasticity did not support the theory. Graphs. 5 ref. (Q23, CN)

527-Q. **Design Aspects of High Temperature Fatigue With Particular Reference to Thermal Stresses.** L. F. Coffin, Jr. *American Society of Mechanical Engineers, Paper No.* 54—A-252, 1955, 19 p.
Design criterion based on experiments carried out on test specimens subjected both to constrained thermal cycling and constant temperature strain cycling. Tables, graphs. 20 ref. (Q7, Q25)

528-Q. **Approximate Solution to Thermal Shock Problems in Plates, Hollow Spheres and Cylinders With Heat Transfer at Two Surfaces.** A. Mendelson and S. S. Manson. *American Society of Mechanical Engineers, Paper No.* 54—A-264, 1955, 29 p.
Mathematical analysis. Graphs. 7 ref. (Q general)

529-Q. **Errors in Deformation Measurements for Elevated-Temperature Tension Tests.** John M. Thomas and John F. Carlson. *ASTM Bulletin,* 1955, no. 206, May, p. 47-51.
Tests illustrate magnitude of errors possible and also additional accuracy of one method of calculating the "effective" gage length for a

test specimen with extensometer attachments beyond the reduced section. Photographs, tables, graphs. (Q27)

530-Q. Plastic Strain and Stress Relations at High Temperatures. III. A. E. Johnson, N. E. Frost and J. Henderson. *Engineer,* v. 199, Apr. 1, 1955, p. 457-458.

Tests to determine plastic strain-stress relations of steel and an aluminum alloy. Table. (Q23, ST, Al)

531-Q. 10-Ton Fatigue Testing Machine. H. L. Cox and N. B. Owen. *Engineering,* v. 179, Apr. 22, 1955, p. 500-504.

Mechanical fatigue testing machine of ten tons load range which operates at the resonant frequency of a mass-spring system, at about 2,000 c.p.m. Diagrams, photographs, tables, graphs. (Q7)

532-Q. Intercrystalline Fracture of Beta-Brasses Containing Aluminium. E. C. W. Perryman. *Institute of Metals, Journal,* v. 83, Apr. 1955, p. 369-377.

Mechanism that causes intergranular failures occurring in binary and ternary beta brasses. Tables, diagram, graphs. 21 ref. (Q26, Cu)

533-Q. The Effect of Zirconium and Titanium on the Intercrystalline-Cracking Tendency of Beta-Brasses. E. C. W. Perryman and R. J. Goodwin. *Institute of Metals, Journal,* v. 83, Apr. 1955, p. 378-382.

Impact-tensile tests and tests under sustained tensile stress in 3% sodium chloride solution carried out to evaluate effect of these additions on the tendency to intercrystalline flow and fracture. Tables, graph. 4 ref. (Q26, Cu)

534-Q. The Slip-Band Extrusion Effect Observed in Some Aluminium Alloys Subjected to Cyclic Stresses. P. J. E. Forsyth and C. A. Stubbington. *Institute of Metals, Journal,* v. 83, Apr. 1955, 395-399.

Nature and occurrence of surface debris exhibited along parallel cracks of the crystals. Diagrams. 6 ref. (Q24, Al)

535-Q. Creep of Aluminum Under Cyclotron Irradiation. M. R. Jeppson, R. L. Mather, A. Andrew and H. P. Yockey. *Journal of Applied Physics,* v. 26, Apr. 1955, p. 365-367.

Measuring the effect of cyclotron irradiation on the steady-state creep rate of aluminum. Diagram, graph, table. 8 ref. (Q3, Al)

536-Q. Magnetic Measurement of the Hardness of Metals. D. Hadfield. *Metal Treatment and Drop Forging* v. 22, Apr. 1955, p. 153-159.

Development during past 20 years of various types of instruments designed to measure or compare, magnetically, the hardness value of metals. Photographs, table. (To be continued.) (Q29)

537-Q. A General Creep and Recovery Property of Metals. A. J. Kennedy. *Nature,* v. 175, Apr. 16, 1955, p. 674-676.

Mathematics of difference between continuous and discontinuous creep. Graph. 4 ref. (Q3)

538-Q. New Design Concepts for Machine Members Subjected to Fatigue. W. L. Starkey. *News in Engineering at Ohio State University,* v. 27, Apr. 1955, p. 13-16.

Four concepts which may be used as bases for design of machine members subjected to cyclic stresses. Graphs, photographs. (Q7)

539-Q. The Mechanism of Rolling Friction. I. The Plastic Range. II. The Elastic Range. K. R. Eldredge and D. Tabor. *Royal Society, Proceedings,* v. 229, ser. A, Apr. 21, 1955, p. 181-220 + 4 plates.

Study of friction and surface damage produced when a hard steel sphere rolls between flat parallel surfaces of a softer metal, and the mechanism of rolling friction under conditions where the deformations involved are predominantly elastic. Graphs, diagrams, tables, photographs. 34 ref. (Q9)

540-Q. Influence of Solid Particles in Oil on Babbitt, Copper-Lead and Aluminium Bearings. *Scientific Lubrication,* v. 7, Apr. 1955, p. 31-34.

Test procedure and results. Tables, graphs. 7 ref. (Q9, SG-c)

541-Q. More Muscles in Steel. Allen G. Gray. *Steel,* v. 136, Apr. 25, 1955, p. 96-99.

Steel, with tensile properties of 260,000 to 280,000 psi. has strength-weight ratio above the strongest aluminum and commercial titanium alloys. Table, photographs. (Q general, ST, Al, Ti)

542-Q. The Prevention of Stretcher Strains. Henri P. Tardif. *Steel Processing,* v. 41, Apr. 1955, p. 241-244, 260, 263.

Machines used for the removal of the yield point of the steel and the consequent prevention of stretcher strain markings upon drawing in a press. Photographs, graphs, table. 30 ref. (Q23, G4, ST)

543-Q. An Investigation of the Hot Ductility of High Temperature Alloys. E. F. Nippes, W. F. Savage, B. J. Bastian, H. F. Mason and R. M. Curran. *Welding Journal,* v. 34, Apr. 1955, p. 183S-196S.

Details of construction of a device for determining effects of testing temperature and prior thermal history on hot ductility of structural alloys. Diagrams, tables, photographs, graphs, micrographs. 10 ref. (Q23, SG-h)

544-Q. On the Process of Fracture of Plastic Metals. Ya. B. Fridman and T. K. Zilova. *Henry Brutcher Translation No.* 2876, 7 p. (From *Doklady Akademii Nauk SSSR,* v. 73, no. 4, 1950, p. 697-700.) Henry Brutcher, Altadena, Calif.

Principal advantage of macro-method; possibility of studying the progress of fracture from the start to the end. Graphs. micrographs, diagram. 6 ref. (Q26)

545-Q. Residual Stresses in Continuously Cast Aluminum Bars. G. Seeger. *Henry Brutcher Translation No.* 2916, 11 p. (From *Giesserei,* v. 38, no. 14, 1951, p. 325-329.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 526-Q, 1951. (Q25, C5, Al)

546-Q. Wear Caused by Metal-Against-Metal Sliding Friction, With Special Consideration of the Effect of Temperature. I-II. W. Rädeker. *Henry Brutcher Translation Nos.* 3460-3461, 42 p. (Slightly abridged from *Archiv für das Eisenhüttenwesen,* v. 15, no. 10, 1942, p. 453-469.) Henry Brutcher, Altadena, Calif.

Study of wear processes at temperatures ranging from −310 to 1300° F. Graphs, photographs, micrographs. 32 ref. (Q9)

547-Q. (English.) **Dislocation Theory of the Fatigue Fracture of Ductile Metals.** Francisco Eiichi Fujita. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 6, no. 6, Dec. 1954, p. 565-572.

A proposed dislocation theory to explain fatigue crack or small void, growth of void, generation and propagation of a fatigue crack, etc. Diagrams, graphs. 17 ref. (Q7)

548-Q. (German.) **Changing Modulus of Shear of Tin During Transition From the State of Normal Conductivity to the State of Superconductivity.** P. Grassmann and J. L. Olsen. *Helvetica Physica Acta,* v. 28, no. 1, 1955, p. 24-32.

Theoretical analysis, methods of investigation, equipment used. Table, diagram, drawings. 23 ref. (Q2, Sn)

549-Q. (German.) **Hard Metals of Titanium Carbide for High Temperature Use.** K. Pfaffinger. *Planseeberichte für Pulvermetallurgie,* v. 3, no. 1, Feb. 1955, p. 17-33.

Mechanical properties of WZ alloys, with nickel-cobalt-chromium bonding elements, at temperatures up to 1000° C. Tables, graphs, photographs. 16 ref. (Q general)

550-Q. (German.) **Experiments to Unify the Scleroscope Hardness Test.** Hans Schmitz and Wilhelm Schlüter. *Stahl und Eisen,* v. 75, no. 7, Apr. 7, 1955, p. 411-416.

Determination of the scatter range of the individual results of measurement and average results from the five single measurements. Graphs, diagram, table. 2 ref. (Q29)

551-Q. (Hungarian.) **Enrichment of Copper on the Surface of Rolled Steels.** Rezsö Hantos and Ferenc Boda. *Kohazati Lapok,* v. 10, no. 3, Mar. 1955, p. 123-124.

Determination of low-copper steels for investigation of the causes of surface cracking. Suggestions for avoiding the phenomenon. Tables, photograph, graphs. (Q26, F23, AY)

552-Q. (Hungarian.) **Correlation Between the Specific Impact Values Measured in Charpy or Mesnager Specimens.** Nandor Hajto. *Kohaszati Lapok,* v. 10, no. 3, Mar. 1955, p. 136-137.

Comparison made on basis of large number of tests; results and interpretation. Graph. (Q6)

553-Q. (Russian.) **Temperature-Time Dependency of the Strength of Pure Metals.** S. N. Zhurkov and T. P. Sanfirova. *Doklady Akademii Nauk SSSR,* v. 101, no. 2, Mar. 11, 1955, p. 237-240.

Relation of life and activation energy to stress. Graphs, table. 19 ref. (Q7, Q23, Zn, Al, Ag, Pt)

554-Q. (Book.) **Analysis of Statically Indeterminate Structures.** John I. Parcel and Robert B. B. Moorman. 571 p. 1955. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $9.50.

Basic theory and practical authoritative coverage of the problems facing structural engineers. (Q25)

555-Q. (Book.) **Design Manual for High-Strength Steels.** H. Malcolm Priest and John A. Gilligan. 174 p. 1954. United States Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa.

Engineering data on mechanical properties and corrosion resistance. Allowable unit stresses. Designing against corrosion. (Q general, R general, AY)

R — Corrosion

200-R. Case History of Failure of Marine Boiler Tubes by Stress-Corrosion Cracking. R. D. Barer. *Corrosion,* v. 11, Apr. 1955, p. 18-24.

Results of examination of small samples cut from tubes. Mechanism of caustic cracking. Photographs, micrographs, graphs. 25 ref. (R1)

201-R. Corrosion by Valve Packing. L. M. Rasmussen. *Corrosion,* v. 11, Apr. 1955, p. 25-30.

Observations of valve stem pitting during storage, after hydrostatic testing, indicate that the pres-

ence of soluble corrosive agents in the asbestos braid and graphite lubricant were responsible for the condition. Graphs, tables, diagrams, photographs. (R7)

202-R. Current Requirements for Cathodic Protection of Pipe Lines. Marshall E. Parker. *Corrosion,* v. 11, Apr. 1955, p. 52-57; disc., p. 57-58.

Review of definitive methods; recommended procedures. Graphs. 1 ref. (R10)

203-R. Some Corrosion Inhibitors—A Reference List. *Corrosion,* v. 11, Apr. 1955, p. 65-67.

Chemical and trade names, sources of supply, uses, material with which effective, and literature references for 68 inhibitors. Tables. (R10)

204-R. An Interpretation of the Significance of the Potentials of Passive Iron. M. J. Pryor. *Electrochemical Society, Journal,* v. 102, Apr. 1955, p. 163-169.

Explanation of effects of anodic corrosion inhibitors. Graphs. 23 ref. (R10, Fe)

205-R. A Theoretical Basis for a New Method of Investigating Corrosion Inhibition. James G. Jewell. *Electrochemical Society, Journal,* v. 102, Apr. 1955, p. 198-205.

Basis for screening cathodic inhibitors by means of a function that may be determined by potential measurements when an external current is applied. Diagrams. 4 ref. (R10)

206-R. Iron Bacteria in Gasholder Water. A. R. Mitchell. *Gas Journal,* v. 281, Mar. 30, 1955, p. 845-847.

Growth and control. Photographs. (R1, Fe)

207-R. Symposium on Stress-Corrosion. W. D. Robertson. *Metal Progress,* v. 67, Apr. 1955, p. 140 + 4 pages.

A report of papers presented at the "Symposium on Stress-Corrosion Phenomena" held during the 106th Meeting of the Electrochemical Society, Oct. 3-7, 1954, at Boston, Mass. (R1)

208-R. Effect of Temperature on Corrosion of Aluminum. (Digest of "Influence of Temperature on the Rate of Corrosion of Aluminum and Several Aluminum Alloys", by G. V. Akimov and V. V. Romanov; *Doklady Akademii Nauk SSSR,* v. 91, 1953, p. 281-283.) *Metal Progress,* v. 67, Apr. 1955, p. 166, 168, 170, 172.

Previously abstracted from original. See item 22-R, 1954. (R general, Al, Cu, Mg)

209-R. The Corrosivity of Fuming Nitric Acid. John D. Clark and Michael A. Walsh. *New York Academy of Sciences, Transactions,* v. 17, Feb. 1955, p. 279-288.

Mechanism of corrosion of SS-347 in the red and white acids (97 to 98% acid) is evolved. Graphs. 2 ref. (R6, SS)

210-R. Accuracy of Measurements of Corrosion Damage and of Wall Thickness by the Ultrasonic Method. A. Lutsch. *Henry Brutcher Translation No.* 3473, 15 p. (From *Zeitschrift Verein Deutscher Ingenieure,* v. 96, no. 23, 1954, p. 773-777.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 433-R, 1954. (R11, S14)

211-R. (French.) **Study of the Corrosiveness of Sea Water.** A. Hache and P. Deschamps. *Institut de Recherches de la Sidérurgie, Publications,* ser. A. no. 90, Nov. 1954, 7 p. (Reprinted from *Corrosion et Anti-Corrosion,* v. 2, no. 4, July-Aug. 1954, p. 134-140.)

Describes various factors that intervene in the corrosion of steel in comparison with the action of a sodium chloride solution. Tables, drawing, graphs. 6 ref. (R4, ST)

212-R. (German.) **Chemical Attack on Unprotected Aluminum and the Polishing Process.** H. Ginsberg and F. Baumann. *Metall,* v. 9, nos. 5-6, Mar. 1955, p. 160-163.

Effect of surface treatment on the behavior of aluminum in sodium chloride solution shows necessity of anodic treatment to protect surface. Graphs, photographs, micrographs. 6 ref. (R5, L19, Al)

213-R. Factors and Prevention of Corrosion. C. L. Hibert. *Aero Digest,* v. 70, Apr. 1955, p. 22-31.

A guide to the problem of judging, designing against, and preventing corrosion in aircraft. Diagrams, tables. 5 ref. (R general)

214-R. Salt Spray Corrosion of Cadmium. Russell H. Wolff. *Metal Finishing,* v. 53, Apr. 1955, p. 48-55.

Gives curves relating weight change to exposure time. Graphs, micrographs, tables. 4 ref. (R11, Cd)

215-R. How Arkansas Fuel Oil Tackled Corrosion. W. M. Kyger and G. L. Shepherd. *Oil and Gas Journal,* v. 53, Apr. 18, 1955, p. 141-143.

Plant-wide program for control of CO_2 and H_2O attack in this sweet hydrocarbon treating unit. Tables. (R7)

216-R. (German.) **Corrosion and Heat of Activation.** Max Werner. *Werkstoffe und Korrosion,* v. 6, no. 3, Mar. 1955, p. 113-117.

On the corrosion of aluminum and steel caused by different corrosive agents. Graphs, diagram. 4 ref. (R general, Fe)

217-R. (German.) **Oxidation and Corrosion at Medium and Low Temperatures.** Karl Hauffe. *Werkstoffe und Korrosion,* v. 6, no. 3, Mar. 1955, p. 117-129; disc., p. 129-130.

Because the oxidation and corrosion mechanisms are more complicated, owing to the presence of surface layer electrical fields, the mechanism of passivators on iron and nickel are considered, and a theory on corrosion resistance of chromium-nickel steels is presented. Diagrams, graphs. 39 ref. (R2, R10, Fe, Ni, AY)

218-R. (German.) **On Corrosion of Lead in Distilled Water.** Tihomil Markovic. *Werkstoffe und Korrosion,* v. 6, no. 3, Mar. 1955, p. 133-135.

Influence of the diffusion of oxygen. Photograph, graphs. 14 ref. (R4, Pb)

219-R. (German.) **The Mechanism of the Decomposition of Hydrogen Peroxide on Metallic Lead.** Tihomil Markovic. *Werkstoffe und Korrosion,* v. 6, no. 3, Mar. 1955, p. 136-141.

Results obtained from potentials of the galvanic cells Pb/Pt and Pb/Ag, plotted against time, determined the mechanism of catalytic decomposition. Graphs, tables. 9 ref. (R1, Pb)

220-R. (Russian.) **Hydraulic Protection of Turbines From Cavitation Corrosion.** G. S. Makee and K. K. Shal'nev. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1954, no. 11, Nov., p. 87-104 + 2 plates.

Design and operating conditions of turbines under test. Types of cavitation causing damage, suggested corrective measures. Diagrams, tables, photographs, graphs. 17 ref. (R2, CI, ST)

221-R. The Use of Additives for the Prevention of Low-Temperature Corrosion in Oil-Fired Steam-Generating Units. E. C. Huge and E. C. Piotter. *ASME, Transactions,* v. 77, Apr. 1955, p. 267-274; disc., p. 274-278.

Test data and results of actual operating experience which show effect of additives on the corrosive nature of flue gases. Photographs, tables, graphs, diagrams. 10 ref. (R7)

222-R. Influence of Fine Particles on Corrosion of Economizer and Air-Preheater Surfaces by Flue Gases. Peter Hodson. *ASME, Transactions,* v. 77, Apr. 1955, p. 279-285; disc., p. 285-286.

A qualitative test of the formation temperature, extent and nature of deposits from cleaned and dirty gas showed that deposits tend to build up in a narrow range and that cleaning the gas greatly decreases the rate of deposit build-up. Table, micrographs, diagram, photograph. 12 ref. (R7)

223-R. Titanium Reference Sheet. II. G. E. Hutchinson. *Chemical Engineering Progress,* v. 51, Apr. 1955, p. 38.

Data on corrosion. (R general, Ti)

224-R. Advantages of Wood-Lined Steel Pipe in Corrosive Services. E. H. Bronstein. *Corrosion,* v. 11, May 1955, p. 205-209.

Wood-lined steel pipe is extensively used to transport corrosive and abrasive substances at temperatures up to 185° F. Photographs, tables. 26 ref. (R10, ST)

225-R. High Temperature Corrosion Data. *Corrosion,* v. 11, May 1955, p. 241-245.

By means of tables, corrosion rates are indicated as low, moderate, or high versus specific temperatures. Tables. (R general)

226-R. Results of Some Marine-Atmosphere Corrosion Tests on Magnesium-Lithium Alloys. P. D. Frost, F. W. Fink, H. A. Pray and J. H. Jackson. *Electrochemical Society, Journal,* v. 102, May 1955, p. 215-218.

Ultralight, high-strength alloys for structural applications exposed for 32 months to the seacoast atmosphere near Daytona, Fla. One experimental alloy, containing about 9% lithium, had almost as good corrosion resistance as a commercial magnesium-aluminum-zinc alloy. Micrographs, graphs, table. 8 ref. (R3, Mg)

227-R. On the Nature of Lead Surfaces Passivated in Sulfuric Acid. E. J. Casey and K. N. Campney. *Electrochemical Society, Journal,* v. 102, May 1955, p. 219-225.

Experimental results show that the rate of ennoblement of the electrochemical potential of lead, which is passivated in sulfuric acid, is markedly dependent on the concentration of hydrogen peroxide, whether formed by irradiation or added directly to the system. Graphs, micrographs, circuit diagram, tables, diagram. 14 ref. (R10, Pb)

228-R. The Interactions of Static Stress and Corrosion With Aluminium Alloys. F. A. Champion. *Institute of Metals, Journal,* v. 83, Apr. 1955, p. 385-392.

Use of alloy compositions and heat treatments designed to give the highest mechanical properties tends to result in varying degrees of susceptibility to stress-corrosion. Graphs, tables. 27 ref. (R1, Al)

229-R. Rate of Formation of Film on Metals and Alloys. G. P. Chatterjee. *Journal of Applied Physics,* v. 26, Apr. 1955, p. 363-365.

Film growth on copper-zinc and copper-magnesium alloys with or without the addition of aluminum or manganese. Tables, graphs. 4 ref. (R2, Cu, Zn, Mg, Mn, Al)

230-R. Current Requirements for Cathodic Protection of Well Casing. Leendert de Witte. *Oil and Gas Journal,* v. 54, May 9, 1955, p. 109-116.

Considers interpretation of both open hole and inside casing spontaneous potentials surveys with regard to prediction and treatment of external casing corrosion. Graphs, tables, circuit diagrams. 5 ref. (R10)

231-R. Smart Control of Humidity Licks Metal Corrosion During In-Process Storage. A. M. Beebee, Jr. *Power*, v. 99, May 1955, p. 110-111.

Design of in-process storage room. Photographs. (R3, ST)

232-R. An Interesting Case of Corrosion of Steam Turbines. A. Splittgerber. *Henry Brutcher Translation No.* 2925, 5 p. (From *Vom Wasser* (A Yearbook for Water Chemistry and Water Purification), v. 17, 1949, p. 146-149.) Henry Brutcher, Altadena, Calif.

Effect of steam and mixtures on corrosion of steel at 210° F. Corrosion phenomena of idle turbines explained. Table, diagram. (R4, SS, ST)

233-R. (Russian.) **Relation of the Corrosion Rate of Iron to the pH of Solution, and the Passivation of the Metal in Alkaline Solutions.** L. K. Lepin', A. Ia. Vaivade and Z. F. Oshis. *Zhurnal Fizicheskoi Khimii*, v. 29, no. 2, Feb. 1955, p. 350-355 + 1 plate.

Oxidation kinetics of iron in various media; transition from gamma to alpha form. Retardation of corrosion at certain pH values. Graphs, table, diffraction patterns. 10 ref. (R2, R10, Fe)

S — Inspection and Control

73-S. Acceptance Sampling of Electroplated Articles. J. M. Cameron and Fielding Ogburn. *American Electroplaters' Society, Proceedings*, v. 41, 1954, p. 19-22.

Basic ideas behind acceptance sampling. Graphs. 3 ref. (S12, L17)

74-S. Air Gaging Proves Economical for Short Run Parts. C. K. Swafford. *Iron Age*, v. 175, Apr. 7, 1955, p. 129-131.

Air gages on grinders, boring mills and superfinishing equipment are used to gage part tolerances of 0.0007 in. and less. Photographs. (S14)

75-S. Magnetic and Electromagnetic Sorting of Semifinished Steel and of Mass-Produced Parts. F. Förster. *Henry Brutcher Translation No.* 3467, 20 p. (Condensed from *Archiv für das Eisenhüttenwesen*, v. 25, nos. 7-8, 1954, p. 383-392.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 366-S, 1954. (S10, ST)

76-S. How to Sort Plain Carbon Steels by Spark Testing. W. Jäniche and K. H. Saul. *Henry Brutcher Translation No.* 3472, 5 p. (Condensed from *Stahl und Eisen*, v. 68, nos. 17-18, 1948, p. 301-303.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 10B-25, 1949. (S10)

77-S. Isotopes and Metals Engineering. I. G. G. M. Carr-Harris. *Canadian Metals*, v. 18, Apr. 1955, p. 26-28, 30, 32.

Uses of radio-isotopes in the design and production of metal products. Photographs. (To be continued.) (S19)

78-S. (Czech.) **Photometric Determination of Aluminum in Steel.** K. Wacykiewicz. *Prace Instytutow Ministerstwa Hutnictwa*, v. 7, no. 1, 1955, p. 35-42.

Amounts of aluminum in steel determined by use of aluminon and eriochromecyanine. Graphs, tables. 32 ref. (S11, Al, ST)

79-S. (Czech.) **The Magnetic Powder "Aero" for Electromagnetic Determination of Steel Surface Defects.** Julius Subert and Jaroslav Jares. *Slévarenstvi*, v. 3, no. 3, Mar. 1955, p. 75-77.

Possibilities of the steel surface defectoscopy method by means of detection fluid and magnetic powder. Photographs. (S15)

80-S. (French.) **Industrial Control by Ultrasonics.** Jean Daurat. *Métallurgie et la construction mécanique*, v. 87, no. 3, Mar. 1955, p. 191-193, 195.

Describes reflectogage, an apparatus for ultrasonic control of materials by resonance; application to brazed joints. Diagram, reflectograms. (To be continued.) (S14)

81-S. (French.) **Signaling, Counting or Registration of the Defects of the Metallurgical Products, by Means of Ultrasonic Sounding With Echo.** L. Beaujard, V. Husarek and A. Vasset. *Revue de métallurgie*, v. 52, no. 3, Mar. 1955, p. 240-248.

Possibilities of mapping or counting defects in a given piece. Oscillograms, photographs, diagrams, micrographs. 4 ref. (S13)

82-S. A Re-Evaluation of Surface Finish. L. Chaney and C. H. Good. *American Society of Mechanical Engineers, Paper No.* 54—A-192, 1955, 9 p.

Correlation of surface finish with performance characteristics of machined parts. Effect of size of roughness width cut-off on finish standards. Tables, graphs, diagram. (S15)

83-S. Magnetic Particle Technique Makes Billet Inspection Positive and Efficient. O. G. Smith. *Iron Age*, v. 175, May 5, 1955, p. 99-101.

Benefits of billet inspection, using magnetized particles and ultraviolet light to detect flaws. Photographs. (S13, ST)

84-S. Metallurgical Inspection of Jet-Engine Parts. *Machinery*, v. 61, May 1955, p. 154-158.

Inspection practices to assure structural soundness of precision parts for jet engines and electronic guidance systems. Photographs. (S13)

85-S. Aluminium Casting Alloys. *Metallurgia*, v. 51, no. 306, Apr. 1955, p. 171-174.

Particular reference to alloys of B.S. 1490:1949 and to the aluminum-zinc-magnesium alloys. Tables. (S22, Al)

86-S. Automatic Temperature Control of Oil and Gas-Fired Furnaces. Leo Walter. *Metal Treatment and Drop Forging*, v. 22, Apr. 1955, p. 150-152.

Available methods: their selection and requirements. Circuit diagram, graphs. (S16, J general)

87-S. Practical Methods of Steel Identification. Howard E. Boyer. *Modern Machine Shop*, v. 27, May 1955, p. 140 + 9 pages.

Applicable where highly diversified manufacturing operations are performed and where problems revolving around mixed steels tend to become sizable. Diagram, photograph. (To be continued.) (S10)

88-S. Short Cut in Billet Conditioning. *Steel*, v. 136, May 2, 1955, p. 114, 117.

Method of speeding up inspection of semifinished steel for the tube mill. Photographs. (S general, ST)

89-S. Uses of Ultrasound in Technology and Physics. S. Ya. Sokolov. *Henry Brutcher Translation No.* 3029, 14 p. (From *Zavodskaya Laboratoriya*, v. 14, no. 11, 1949, p. 1328-1335.)

Technical applications of ultrasonic waves; development and use of an ultrasonic microscope. Graphs, diagram, circuit diagrams, micrographs, photograph. 8 ref. (S13, M23)

90-S. (French.) **Gammagraphic Examination of Light-Alloy Cast Pieces by Means of the Radio Isotope, Thulium 170.** Albert Blondel and Pierre Broquet. *Fonderie*, 1955, no. 110, Mar., p. 4427-4433.

Methods of use; quality study of radiographic images; examination of a copper-aluminum alloy. Diagrams, gammagraphs. 13 ref. (S13, Cu, CI)

91-S. (Pamphlet.) **Correlation List of American and European Composition of Stainless Steel.** Report no. PB 111549. 12 p. 1954. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $0.50.

Provides the American Iron and Steel Institute specifications for 33 types, and a comparison is made with principal European steels. (S22, SS)

T — Applications of Metals in Equipment

50-T. A New Toolsteel of High Cutting Capacity. (Digest of "Contribution to the Study of 'Rollodur', A Steel of High Cutting Capacity", by Albert Collaud; *Von Roll Mitteilungen*, v. 11, July-Dec. 1952, p. 73-91.) *Metal Progress*, v. 67, Apr. 1955, p. 152, 154-156.

Previously abstracted from original. See item 85-T, 1953. (T6, TS)

51-T. Uranium as Fissionable Material in Nuclear Reactors. K. Stokland and H. Chr. Neeb. *Henry Brutcher Translation No.* 3475, 15 p. (From *Forsvarets Forsknings Institutt Arbok* III, 1950-1951, p. 17-27.) Henry Brutcher, Altadena, Calif.

Refining of uranium, fabrication of uranium fuel rods. 8 ref. (T25, U)

52-T. Titanium—1954-55, an Inventory of Progress. C. I. Bradford. *Rem-Cru Titanium Review*, v. 3, Jan. 1955, p. 1-3.

New aircraft and ordnance uses of the metal. (T24, Tl, Ti)

53-T. Titanium—the Tough Lightweight. A. Hurlich. *Army Information Digest*, v. 10, May 1955, p. 30-36.

Applications in military equipment. Photographs. (T2, Ti)

54-T. Structural Design With Formed Aluminium Sheet. III. Cedric Marsh. *Light Metals*, v. 18, Apr. 1955, p. 124-127.

Various sections made from formed sheet and their design to prevent failure. Graphs, tables. (T26, Al)

55-T. Metals for Short Time Service at High Temperatures. Alan Levy. *Materials & Methods*, v. 41, Apr. 1955, p. 117-132.

Selection problems and the materials most suitable for turbojet afterburners, ramjet engines and rockets. Photographs, graph, tables, diagrams. (T25, SG-h)

56-T. Modern Steels for Plastic Moulds and Hobs. R. Groves. *Plastics*, v. 20, Apr. 1955, p. 127-128.

Steel molds and hobs in the plastic industry. Tables. (T29, TS)

57-T. Special Hardenable Iron Developed for Tappets. Herbert Chase. *Automotive Industries*, v. 112, May 1, 1955, p. 52-55.

Development and testing of the hardenable iron. Micrographs, table, diagram. (T7, Fe)

58-T. Application of Germanium Power Rectifiers. R. M. Crenshaw. *Electrical Engineering,* v. 74, May 1955, p. 418-422.

Applications include its use in the chemical, aluminum, steel, titanium and tin reclaiming industries. Graphs, photographs. (T1, Ge)

59-T. Some Recent Developments in Stainless Steels. J. I. Morley. *Iron & Steel,* v. 28, Apr. 1955, p. 143-146.

Three ways of meeting the requirement for a high tensile stainless steel. Photograph, graphs, tables. 4 ref. (To be continued.) (T general, SS)

60-T. Titanium Bolts for Aircraft. *Light Metal Age,* v. 13, Apr. 1955, p. 18-19.

Light-weight titanium bolts equal or exceed performance of present-day, high-strength aircraft bolts. Table, graph, photographs. (T7, Ti)

61-T. The Use of Creep-Resisting Steels in Steam Power Plants. H. W. Kirkby. *Metallurgia,* v. 51, no. 306, Apr. 1955, p. 165-170.

Steels for piping, turbine rotors and blades and bolts. Graphs, tables. 33 ref. (T25, AY)

62-T. How Magnesium Can Simplify Airframe Design. J. P. Donald Garges. *Modern Metals,* v. 11, Apr. 1955, p. 40-42, 44.

Improvement in ductility of the available magnesium alloys has placed them in the acceptable range for aircraft structural applications. Photographs, graph. (T24, Mg)

63-T. Electrical Spotlight Focuses on Aluminum. *Power,* v. 99, May 1955, p. 76-77.

Applications and problems in switchgear, transformers, distribution and rotating machines. Photographs. (T1, Al)

64-T. The Manufacture of Blades, Buckets and Vanes for Turbine Engines. A. T. Colwell. *Steel Processing,* v. 41, Apr. 1955, p. 215-228, 253.

Methods of manufacture and the materials used. Photographs, tables. (T25)

65-T. (German and French.) **Aluminum and Infra-Red Radiation.** W. v. Berlepsch-Valendas. *Aluminium Suisse,* v. 5, no. 2, Mar. 1955, p. 64-69.

High reflective property of aluminum makes it an excellent material for infra-red radiation equipment. Photographs, graphs. (T29, T5, P17, Al)

V

Materials

General Coverage of Specific Materials

121-V. What the Future Holds for Titanium. H. H. Kellogg. *Engineering and Mining Journal,* v. 156, Apr. 1955, p. 72-84.

Uses will be limited to those where weight saving, heat resistance or corrosion resistance justify the extra cost. Tables, flow diagram. (T general, Ti)

122-V. Aluminium-Copper-Cadmium Sheet Alloys. H. K. Hardy. *Institute of Metals, Journal,* v. 83, Mar. 1955, p. 337-346 + 1 plate.

Mechanical, corrosion, and fabricating properties. Tables, micrographs, graphs. 29 ref. (Cu, Cd, Al)

123-V. Hiduminium RR.77. Heat Treatable Aluminum Alloy. *Alloy Digest,* no. Al-26, May 1955.

Composition, physical constants, heat treatment, machinability, workability, weldability and applications. (Al)

124-V. Ampco Metal 12. Aluminum Bronze. *Alloy Digest,* no. Cu-26, May 1955.

Composition, physical constants, mechanical properties, machinability, weldability, corrosion resistance and applications. (Cu)

125-V. Dowmetal R & RC. Magnesium Die Casting Alloys. *Alloy Digest,* no. Mg-17, May 1955.

Composition, physical constants, mechanical properties, castability, machinability, corrosion resistance, finish and applications. (Mg)

126-V. Cerrosafe. Low Temperature Melting Alloy. *Alloy Digest,* no. Pb-2, May 1955.

Composition, physical constants, properties, selection and preparation of mold, casting, melting practice, soldering and applications. (SG-d, Pb)

127-V. Hy-Tuf. Tough, Through-Hardening Steel. *Alloy Digest,* no. SA-30, May 1955.

Composition, physical constants, properties, heat treatment, workability, weldability, machinability and applications. (AY)

128-V. Multimet Alloy (N-155). High-Temperature, Heat-Resistant Alloy. *Alloy Digest,* no. SS-28, May 1955.

Composition, physical constants, properties, heat treatment, machinability, workability, weldability and applications. (SG-h, SS)

129-V. Allegheny Metal 350. Heat Treatable Stainless Steel. *Alloy Digest,* no. SS-29, May 1955.

Composition, physical constants, properties, heat treatment, machinability, workability, weldability, corrosion resistance and applications. (SS)

130-V. Jessop 2-B. Hot Work Die Steel. *Alloy Digest,* no. TS-33, May 1955.

Composition, properties, heat treatment, machinability, workability and applications. (TS)

131-V. Commercial Zirconium. John L. Everhart. *Materials & Methods,* v. 41, Apr. 1955, p. 112-115.

Physical and mechanical properties, corrosion resistance, fabrication and applications. Photographs, tables, graph. 7 ref. (Zr)

132-V. Tool Steels and Their Application. R. F. Spillett. *Tool Engineer,* v. 34, May 1955, p. 71-77.

Deals with heat treating, composition and uses of tool steels. Photographs, diagrams, graph, tables. (T general, TS)

133-V. (English.) **Extra Low Carbon Stainless Steels.** *Aciers Fins & Spéciaux Francais,* 1954, no. 18, Dec., p. 87-89.

Manufacture, corrosion resistance, fabrication properties and applications. Photographs. (SS)

134-V. (French.) **Study of Some Austenitic Nodular Cast Irons.** Jacques Grilliat. *Fonderie,* 1955, no. 109, Feb., p. 4373-4384.

Composition, mechanical and physical properties of Ni-Resist. Diagram, micrograph, tables, graph. 12 ref. (CI)

135-V. (French.) **Influence of Impurities on the Properties of Sand-Molded Bronzes.** Pierre Julien Le Thomas. *Fonderie,* 1955, no. 109, Feb., p. 4392-4396.

Influence of iron, manganese, aluminum, sulfur, phosphorus, antimony and arsenic on properties and structure. Graphs, table, micrograph. 29 ref. (E11, Cu)

136-V. (French.) **High-Strength Cast Irons Without Special Elements.** J. Pascal. *Métallurgie et la construction mécanique,* v. 87, no. 3, Mar. 1955, p. 173, 175, 177, 179.

Bibliography on techniques of producing high-strength castings. (To be continued.) (CI)

137-V. (French.) **The Platinum Metals.** Albert Portevin. *Revue de métallurgie,* v. 52, no. 3, Mar. 1955, p. 173-178.

Development, extraction, refining, production, characteristics and uses of platinum. Tables. 2 ref. (EG-c, Pt)

138-V. (German.) **Structure, Mechanical Behavior, and Standardization of Gray Cast Iron in the Light of a Bivariant System.** A. Collaud. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 21, no. 3, Mar. 1955, p. 65-76.

Theoretical and experimental investigation of composition and heat treatment and their influence on physical properties of gray cast iron. Tables, diagrams. (To be continued.) (P general, M general, CI)

139-V. (Russian.) **Manganese-Titanium Pearlitic Malleable Cast Iron.** P. P. Berg and N. D. Titov. *Liteinoe Proizvodstvo,* 1955, no. 3, Mar., p. 9-10.

Influence of varying amounts of titanium and manganese additions on the structure and properties of cast iron; heat treatment conditions. Graph. (M general, P general, CI, Ti, Mn)

140-V. Cast High Strength Irons to Standard Stock Sizes and Shapes. Oliver Smalley. *Iron Age,* v. 175, Apr. 21, 1955, p. 100-102.

Microstructure, properties and applications of Meehanite cast iron. Photographs, microscopes, table. (CI)

141-V. Titanium Fabrication Study. *Light Metal Age,* v. 13, Apr. 1955, p. 16 + 4 pages.

Highlights of investigation conducted on various fabrication techniques. Photographs.
(F general, G general, Ti)

142-V. Wrought Stainless Steel. Basil T. Lanphier. *Machine Design,* v. 27, May 1955, p. 183-190.

Machinability, hot and cold working, forging, cutting and shearing, stamping, deep drawing, welding, brazing, soldering and finishing. Tables, photographs. (SS)

143-V. Gray Iron. C. F. Walton. *Machine Design,* v. 27, May 1955, p. 190-193.

Castability, section sensitivity, machinability, finishing, specifications. Tables, photographs, graph. (CI)

144-V. Malleable Iron. James H. Lansing. *Machine Design,* v. 27, May 1955, p. 194-196.

Castability, tolerances, machinability, standards. Table, photographs. (CI)

145-V. Cast Steel. Charles W. Briggs. *Machine Design,* v. 27, May 1955, p. 196-202.

Castability, tolerances, weldability, machinability. Graphs, tables, photographs. 3 ref. (CI)

146-V. Cast Stainless Steel. E. A. Schoefer. *Machine Design,* v. 27, May 1955, p. 203-205.

Machinability, welding procedures, heat treatment. Photographs, tables. (SS)

147-V. Wrought Aluminum Alloys. T. F. McCormick. *Machine Design,* v. 27, May 1955, p. 213-219.

Heat treatment, cold forming, machinability, extrusion, forging, welding, brazing, soldering, finishing. Photographs, table. (Al)

148-V. Cast Aluminum Alloys. G. W. Birdsall. *Machine Design,* v. 27, May 1955, p. 220-227.

Castability, machinability, weldability, finishing. Photographs, tables. (Al)

149-V. Magnesium Alloys. Paul L. Filter. *Machine Design,* v. 27, May 1955, p. 228-231.

Castability, formability, machinability, weldability, finishing characteristics. Photographs, tables. (Mg)

150-V. A High Strength Zirconium Alloy: Zirconium—4 w/o Tin—1.6 w/o Molybdenum. W. Chubb, G. T. Meuhlenkamp and G. K. Manning. *U. S. Atomic Energy Commission, BMI*-987, Mar. 18, 1955, 26 p.

A heat treatable, ternary alloy is readily rolled at 800°C. and has more than four times the creep strength of pure zirconium at 500°C. The alloy is harder in the air-quenched condition than as water quenched. Behavior was found to be associated with a reaction similar to age hardening. In the annealed condition, the strength of the alloy is insensitive to minor compositional changes. Graphs, tables, micrographs. 7 ref. (Zr)

151-V. (French.) **Nickel Bronzes.** *Fonderie,* 1955, no. 110, Mar., p. 4438-4441.

Structure of copper-nickel-tin alloys, causes of failure, fusion testing. Tables, diagrams. 4 ref. (Cu, Ni)

152-V. (Book.) **Magnesium Design Notes.** 136 p. 1954. Dow Chemical Co., Midland, Mich.

Mechanical, physical, and fabricating properties. Stability of treated surfaces. (Mg)

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The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M. 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

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METALLURGICAL ENGINEER: With experience in nonferrous production and control for middle Atlantic state single plant operation. Furnish complete resume and salary desired in first letter. Box 6-10.

METALLURGICAL GRADUATE: Opening in laboratory of specialty steel mill making high speed, tool, stainless and other specialty steels as well as high-temperature alloys. Work would include metallurgical and metallographic examination of products made of these materials, investigating mill problems and writing of reports on work performed. Some experience preferred. Reply giving details of experience, education, age, references, etc. Box 6-15.

METALLURGIST: With aptitude for research and development in the field of high alloy steels. Prefer man with laboratory experience, possessing sound background in physical metallurgy, capable of organizing research projects and writing clear, concise reports. Opportunities for professional development and advancement. Location: Pittsburgh. In reply, indicate training, experience, military status and salary requirements. Box 6-20.

METALLURGIST: Progressive eastern metal fabricating company has excellent opening for a graduate metallurgist, 27 to 40 years of age. Applicants are preferred who have had approximately five years experience in aluminum casting, rolling or extrusion. Please include in your reply complete information concerning education, experience and salary requirements. Box 6-25.

EXTRUSION DIE DESIGNER: Large eastern metal fabricating company has excellent opening in die design department. If you are familiar with the extrusion of aluminum tubes and shapes, particularly the design of hollow shape dies and their applications, write setting forth your education, experience and salary required. Box 6-30.

ROLLING MILL SUPERVISOR: Excellent opening for rolling mill supervisor age 30 to 50 with progressive eastern metal fabricating company. Applicant should have ability to supervise and train personnel in the rolling of aluminum light-gage sheet, coils and foil. Four-high mill experience desired. Please include details covering education, experience and salary desired in first letter. Box 6-35.

METALLURGIST or CHEMICAL ENGINEER: Graduate, experienced or recent graduate, for production metallurgy (quality control) in nonferrous metals fabrication. Position requires diversified background of chemical, metallurgical and, to some extent, engineering knowledge. Must have, or be able to assimilate, detailed knowledge of the technique, methods and equipment used for all operations of mills, including rolling and/or forming of strip, sheet, plate and/or tube stock. Must be able to keep in touch and make checks in mill on gage, temper reductions, surface quality, hot rolling, annealing and lubrication mixtures to see that proper standard methods are used. Will conduct experiments for purpose of increasing production, improving quality or solving mill processing difficulties. Salary commensurate with experience and ability. Write: W. S. Prentiss, Industrial Relations Manager, Revere Copper and Brass Inc., P.O. Box 2075, 1301 Wicomico St., Baltimore 3, Md., or B. A. Grove, Employment Manager, Revere Copper and Brass Inc., 2200 North Natchez Ave., Chicago 35, Ill.

METALLURGIST: Several openings available in both plant production and research problems connected with stainless steel operations. B.S. degree in engineering required. Excellent opportunity for young man to establish in large and progressive organization where employee training and development receive keenest attention to fulfill company policy of promotions from within. Box 6-40.

Midwest

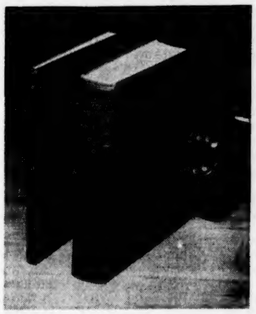
METALLURGIST or METALLURGICAL ENGINEERS: For applied research in ferrous or nonferrous, physical, process, foundry, welding, ore dressing, metallography or related work. GRADUATE MECHANICAL ENGINEERS: For applied research in thermodynamics, automotive engineering, instrumentation, kinematics and statics, machine design, strength of materials and related fields.

GRADUATE PHYSICISTS: For applied research in reactor technology, solid state, engineering physics, applied mechanics, optics and related fields. GRADUATE CHEMICAL ENGINEERS: For applied research in broad and general field of chemical engineering. Prefer men under 40, salary range for all openings from approximately $400 to $800 per month.

(Continued on p. 50)

THE METALS HANDBOOK

and 1954 Supplement



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Metal Progress needs a man who can take charge initially of digests and correspondence pages and articles in limited portion of editorial field appropriate to his experience. Degree in metallurgical engineering (or its equivalent) and some plant experience almost essential for future advancement. Ability and desire to write direct, simple, colloquial American essential; editorial experience desirable but not necessary. Salary in proportion to education, metallurgical and editorial experience. Send account of qualifications to: M. R. Hyslop (Confidential), Managing Editor, Metal Progress, 7301 Euclid Ave., Cleveland 3, Ohio.

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NEW EXPANDING

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Physical Metallurgist, with at least a B.S. degree and 2 years' experience, for working mainly with non-ferrous metals used in the electronic industry; development and investigation of new applications, trouble-shooting, also determining micro-structural and physical characteristics, specification writing, and general metallurgical work in the structural use of metals.

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These are career openings for men looking for unusual opportunities for professional growth, expression of individual initiative, advancement on merit and opportunity to continue their education in our laboratories in an informal, stimulating academic atmosphere. We invite for interview, at our expense, men whose qualifications are of interest to us, and will pay first $200 of reasonable moving expense for those hired, plus half of reasonable moving expense over $200 to a maximum of $500. Write: Russell S. Drum, Personnel Manager, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

PLANT MANAGER: Experienced, for small progressive alloy steel foundry in Michigan. Technical background preferred but not necessary. Splendid connection for right man. Box 6-45.

FERROUS METALLURGIST: U. S. citizen with B.S. in metallurgical engineering and a minimum of two years of steel mill experience. Technologist position in research and development department of large midwestern steel mill. Both laboratory and production type experimentation to improve properties of and manufacturing practices for a wide variety of plain carbon, alloy and stainless steels and cast irons. Opportunities for promotion. Reply stating age, education, experience and salary requirements. Box 6-50.

FOUNDRY SUPERINTENDENT: Major manufacturer is seeking top foundry man with precision casting experience for position of responsibility in research activity. Need not possess degree but should have sound experience in this field. Very attractive opportunity with excellent growth potential. Box 6-55.

RESEARCH METALLURGISTS: Metallurgical engineers with M.S. or B.S. degrees for positions of responsibility in research department of major automobile manufacturer. At least two years experience desirable. Box 6-60.

RESEARCH ASSOCIATE: Opportunity for full or part-time employment on government contract while working for advanced degree in physical or mechanical metallurgy. Graduate study and remuneration commensurate with research duties. Apply to: Department of Metallurgy, The Technological Institute, Northwestern University, Evanston, Ill.

ASSISTANTSHIPS and FELLOWSHIPS: Available to students with degrees in science or engineering and an interest in physical or mechanical metallurgy. Apply to: Department of Metallurgy, The Technological Institute, Northwestern University, Evanston, Ill.

METALLURGICAL ENGINEER: Permanent academic position in physical metallurgy, large midwest university, teaching advanced undergraduate, graduate courses and research. Prefer relatively young Ph.D. with interest in thermodynamics and solid state physics. Will consider others. Salary and rank dependent on qualifications. Box 6-65.

PHYSICAL METALLURGISTS: Persons with better than average basic training needed for interesting and important programs in research and development. Assignments and responsibilities can be arranged to match most fields of specialization or levels of professional stature. Many professional advantages and tuition paid graduate work at IIT. Write: T. E. DePinto, Armour Research Foundation, Illinois Institute of Technology, 10 West 35th St., Chicago 16, Ill.

Foreign

SALES ENGINEER: With metallurgical background preferred, to establish European office for industrial furnace manufacturer. Write full details. Box 6-155.

POSITIONS WANTED

METALLURGICAL ENGINEER: B.S. degree, age 40, married, 17 years diversified experience in the selection, processing, testing and quality control of ferrous and nonferrous metals. Qualified administrator, laboratory supervisor or staff engineer. Desires responsible position in materials and process engineering. Prefers Northeast. Resume available. Box 6-70.

MECHANICAL - METALLURGICAL ENGINEER: B.S. degree, age 42, married, two children. Over 18 years experience in brass mill operations, sales, office management and technical advisory service. Specialist in all technical phases of copper and copper alloys, brasses, bronzes and nickel-silver. Desires management, sales or technical advisory service position. Box 6-75.

PRACTICAL METALLURGIST: Twenty years industrial experience in supervisory position. Chemical and physical testing, supervision of heat treating, development of flame and induction hardening, magnaflux and Zyglo inspection, various types of plating, phosphate and oxide block coatings. Experience also includes planning, purchasing equipment, supervisory duties, complete heat treat department layouts, installation and setting-up procedures and training personnel. Desires supervisory position in heat treating. Box 6-80.

METALLURGISTS

Alloy Development — Composition development for high-temperature and magnetic alloys, phase diagrams, creep, precipitation hardening, vacuum melting and other techniques. Development experience in powder metallurgy, physical metallurgy or alloy systems, background in theoretical physical metallurgy and knowledge of solid state physics useful; M.S. or Ph.D. degree in metallurgical engineering desirable but not required.

Metals Application—Guidance of design and manufacturing engineers in the selection and processing of ferrous and nonferrous metals.

Metallography—Experienced metallurgist to evaluate structures of ferrous and nonferrous commercial and experimental alloys.

Pilot Plant—Follow process, development of casting, working and heat treatment of specialized high-temperature and magnetic alloys.

Send complete resume including salary expectations to:

S. A. Rosecrans
Materials Engineering Dept.
Westinghouse Electric Corp.
East Pittsburgh, Pa.

METALLURGIST: Experienced in aircraft industry, desires challenging administrative position requiring broad and diversified metallurgical background. Box 6-85.

METALLURGIST: M.S. degree, age 31, family, veteran, registered engineer. Has 5½ years experience in fundamental and applied research in physical metallurgy. Experience includes X-ray diffraction and metallography, phase diagrams, vacuum and arc melting. Broad experience in titanium and stainless steels. Technical report writing and publications. Prefers Midwest. Box 6-90.

PROFESSIONAL ENGINEER: Age 34, 13 years diversified experience from research to supervision of volume production. Thoroughly familiar with all heat treating methods, theory and practice. Some experience with plating, forging, welding, stamping and brazing. Experienced in failure analysis, technical reporting, customer and supplier contact. Desires position in senior management, or with advancement opportunity. Box 6-95.

METALLURGICAL ENGINEER: With three years experience in research on nickel alloys and stainless steels, including development, processing, heat treating and testing. Desires challenging position, preferably in East. B.S. degree, age 26, veteran, family. Box 6-100.

NONFERROUS PRODUCTION MAN: Experienced in all phases of hot and cold rolling, extrusion and wire making. For eight years in charge of progress and planning department of copper and brass extrusion mill in England. At present employed in Canada. Desires American appointment with possibilities for advancement. Age 40 years. Box 6-105.

MANAGEMENT ENGINEER: Skilled at gaining confidence of executives for organizational and market analysis, and industrial product promotion. Electrical engineering graduate with 29 years in advertising, sales promotion and field study work. Will go anywhere. Box 6-110.

METALLURGIST: Don't bother me if it's only a job. If it's a challenging position in

METALLURGICAL LIBRARIAN or LITERATURE SPECIALIST

Nine years in rare metals, nine years in ferrous metals, with responsibility for keeping research groups up-to-date on English and foreign literature.

Has organized and managed libraries in rare metals and ferrous metals. Broad experience in patent and research records.

Box 6-130, Metals Review

METALLOGRAPHER

Young graduate metallurgist with at least one to two years experience in industry. Nonferrous experience desirable but not absolutely essential. We are willing to train to some extent, provided the applicant possesses the necessary qualifications. This position offers outstanding opportunities for advancement and growth with an expanding organization. In reply please furnish full particulars regarding background and experience. State salary requirements. Direct reply to:

Employment Supervisor
KAISER ALUMINUM & CHEMICAL CORP.
Trentwood Works
Spokane 69, Washington

ANALYTICAL CHEMIST

Opening for young man with some experience in spectrochemical methods along nonferrous lines. Assignment will involve performing analysis of aluminum alloys, coating, paint, etc., from both production and research standpoints.

We are also interested in reviewing the qualifications of June graduates with B.S. or M.S. degrees in chemistry for a training position. This position offers outstanding opportunities for advancement and growth with an expanding organization. In reply please furnish full particulars regarding background and experience. State salary requirements. Direct reply to:

Employment Supervisor
KAISER ALUMINUM & CHEMICAL CORP.
Trentwood Works
Spokane 69, Washington

the field of processing or fabrication of metals used in A.E.C. programs, I'm interested. My experience is metallurgical engineering, of a supervisory nature, and I've pioneered in the atomic development field. Further information upon request. Box 6-115.

METALLURGIST: B.S. degree, 14½ years of metallurgical experience in aircraft, ordnance, presses, torpedoes and precision casting, both nonferrous and ferrous. Last 3½ years general manager of nonferrous and ferrous precision casting plant. Age 37, married, one child. Box 6-120.

SALES MANAGER: Eastern District. I have an outstanding record with a leading machinery and instrument manufacturer for having successfully organized and directed its Eastern District and export sales. About to sever my connection, am available for another challenging position with headquarters in New York. Quite willing to travel. Box 6-140.

METALLURGIST: B.S. degree in metallurgical engineering, age 28, married, children. Eight years nonferrous refining and jobbing foundry experience in production, process development and quality control. Aware of importance of product quality and cost control. Prefers Midwest. Box 6-145.

METALLURGICAL ENGINEER: M.S. degree, age 32, married. Five years in applied research development and process control. Experience in metalworking, steel, nonferrous and powder metallurgy. Desires responsible position with future in management with progressive organization. Box 6-150.

CHIEF METALLURGIST, DIRECTOR OF LABORATORIES: Graduate metallurgical engineer, professional license. Age 34. Desires position utilizing managerial experience, laboratory control, plating, welding, corrosion, machinability, heat treatment including induction and flame hardening, ferrous and nonferrous. Specifications and inspection systems. East Coast preferred. Minimum salary $10,000. Box 6-160.

METALLURGIST: B.S. degree in metallurgical engineering, age 38, married, three children. Six years experience with tractor manufacturer in heat treating, trouble shooting, material specifications and failure investigations. Limited experience in aluminum foundry. Eight years supervising die servicing department for nonferrous wire manufacturer. Prefers position in Middlewest, West or Northwest. Box 6-165.

METALLURGICAL ENGINEER: Who can make a decision and assume responsibility, wishes to join active development group. Three years experience as a project metallurgist in foundry development, ductile cast iron, impact evaluation, shell molding. Competent report writer, age 27, B.S. degree plus graduate work. Single, veteran. Box 6-170.

SALES ENGINEER: Canadian, B.S. in metallurgy, age 29, married, children. Proven industrial sales record, several years diversified experience in industry, desires to become associated with U. S. manufacturer contemplating representation in Canada or with progressive Canadian company. Prefers Hamilton or Toronto location. Available approximately September 1955. Box 6-175.

SALES ENGINEER: Metallurgist, B.S. degree (M.I.T.), single, age 24, currently engaged in metallurgical development and trouble shooting for leading instrument manufacturer. No previous sales experience but eager to learn. Willing to travel. Prefers New York area but will gladly relocate for unusual opportunity. Available this summer. Box 6-180.

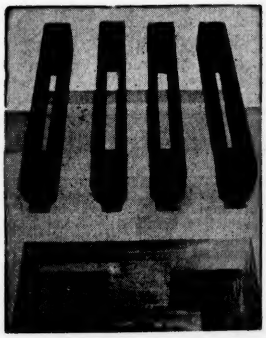
METALLURGICAL ENGINEER: B.S. degree and graduate work in metallurgical engineering. Single, age 37. Technical sales, customer service, development and administrative experience in welding, melting, extrusion, forging, heat treating, machining and other ferrous and nonferrous producing and fabricating processes. Technical report and proposal writing, published articles, public speaking, field demonstrations. Seeks challenging opportunity where technical background and ability to get along with people at all levels and impart technical information are essential. Box 6-185.

ELECTRO-MAGNETIC STIRRING ACTION

Holden Furnaces provide Electro-Magnetic Stirring Action in accordance with the well-known "Motor Law":

> "When a conductor carries the current into the magnetic field there is a force acting on the conductor at right angles to the field and to the current."

Holden Furnaces provide more than just electro-magnetic stirring action. They provide uniformity of plus or minus 5° F., regardless of depth.



Type 701-4 Submerged Electrode Unit with ceramic pot for neutral hardening and annealing 1000-2300°F.

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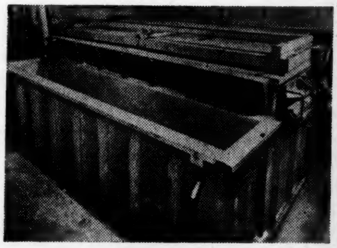
Split Electrode Assembly, as featured on the Type 701-4, is a part of U. S. Patent No. 2,701,269, which provides not only a forced action downward, but also force circulation unparalleled in any electro-magnetic field, with 100% clear working space.



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In normal operation, you will find that our quotation for replacement electrodes is 20% LESS than electrode designs you are now using. If you use the complete design of Holden electrodes and cables, you will also have an additional saving, inasmuch as your work production for the individual furnace will increase approximately 15%.

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